The
TOOL ENGINEER
MACHINERY • PRODUCTION • TOOLS

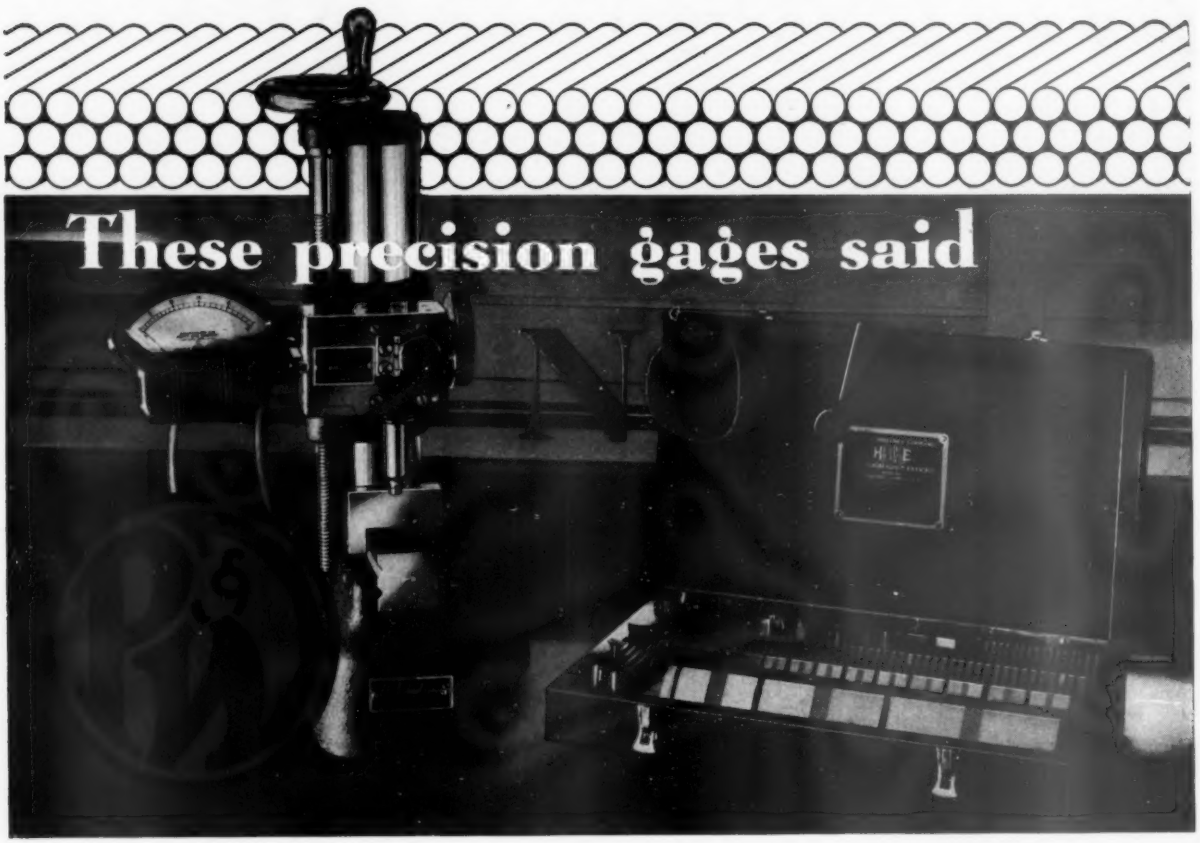
BE MODERN ...equip your machines with

SJOGREN
COLLET
CHUCKS

HARDINGE
BROTHERS, INC.
ELMIRA, N.Y.

ALL SCRAP?

200 PRECISION GROUND SHAFTS



Hear the story. . . . . .

A large company was doing vital national defense work. Among its many activities were two hundred precision ground shafts . . . small pieces required to be accurate within a few ten-thousandths of an inch. The inspectors, using their regular gaging methods, *rejected over 190 of them!*

Immediately there was a controversy between inspection and shop. To settle it a disinterested third party was brought in. He used a PRATT & WHITNEY Electrolimit Comparator and P&W Hoke Precision Gage Blocks . . . both accurate to millionths . . . instruments that could not be questioned. They proved that 187 of the 190-odd rejected shafts were comfortably within the close limits specified. And of equal importance—both shop and inspection agreed that it was a correct finding.

There you have the definite advantage of dependable precision. A serious but useless loss in precious time, badly needed material, and money was averted. Such things happen every day when fine precision work is checked with slightly worn or inferior gages. Modern precision gaging methods prevent that loss.

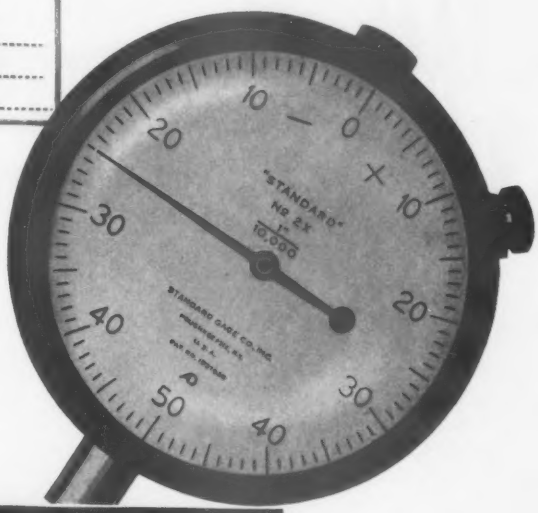
Bring your precision gaging problems to a PRATT & WHITNEY Gage Engineer. He can show you how to put PRATT & WHITNEY *accuracy* to work and make it pay big dividends in your shop. He can help you enormously. *There is no better paying investment than the right gages for the job!*

PRATT & WHITNEY

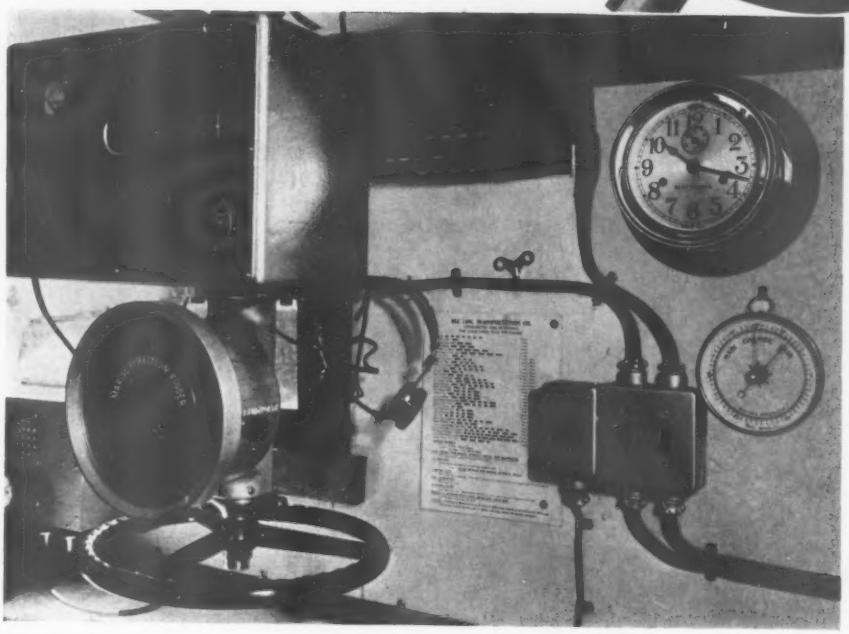
Division **Niles - Bement - Pond Company** • **West Hartford, Connecticut, U. S. A.**

THE ENGINEERING SOCIETY OF DETROIT
AUG 14 1941
REF. TO
FILE

STANDARD
Dial Indicators



"PRECISION in TIME and SPACE"



Navigator's Room On Board a Patrol Ship

The MARINE CHRONOMETER shows 10 hours, 17 minutes, 23 seconds every 12 hours, with a regularity excluding errors of more than a few seconds in a month!

Here is precision and uniformity of operation comparable to that of STANDARD DIAL INDICATORS. Every line on the dial actually represents one "tenth", —no variations allowed.

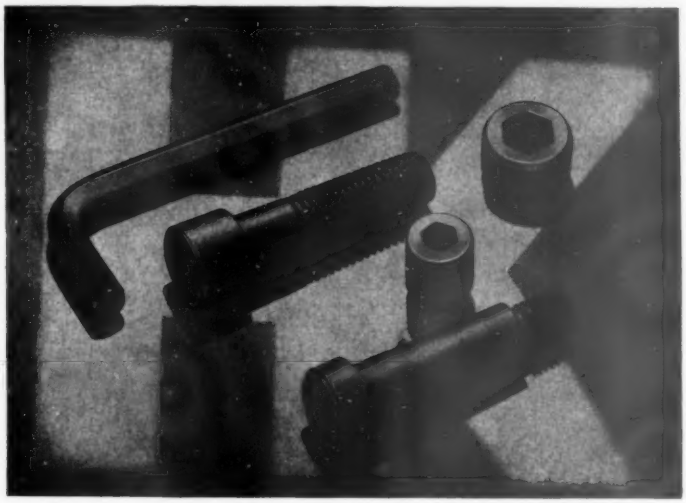
But while the chronometer runs continually in one direction only, Dial Indicators have to invariably maintain their precision under jerks in both directions. They are accurate and shockproof.

Apply for circular.

STANDARD GAGE CO., INC.
70 Parker Avenue
Poughkeepsie, N. Y.

HOLO-KROME

Why SOCKET SCREWS?



because you get

GUARANTEED Unfailing PERFORMANCE

TOOL ENGINEERS
WRITE DEPT. 77 for
SOCKET SCREW STANDARDS

from Every Single Screw

-QUALITY-PERFORMANCE-PRECISION-

THE TOOL ENGINEER

Volume X AUGUST, 1941 Number 8

• Articles

Pursuit Plane Production 43
Explosive Rivets Speed Aircraft Production 61
Toronto Scene of Fall Meeting 66
Recent Innovations in Salt Bath Furnace Practice 69
Multiple Series Press Welding 86

• Editorial

The Party is Over 41

• Features

Production Perspectives 63
Handy Andy Says 92
It's New 94
New Literature 108
A.S.T.E. Doings 114
The Passing Parade 122

• News

Production Perspectives 63
Toronto—Scene of Fall Meeting 66
Classified Advertising 125
ADVERTISERS' INDEX 126

ALLEN C. SIEGEL

General Foreman of the Airplane Division of one of the nation's largest aircraft builders, Tool Engineer Siegel is experienced in the problems of production peculiar to that industry. In his article "Pursuit Plane Production" which appears in this issue he gives a detailed discussion of the manufacture of the Curtiss P-40.

Member
CCA
Controlled Circulation Audit, Inc.

NBP ASSOCIATION
National Business Papers Assn.

Indexed Annually in the December Issue.

Published the first Thursday of each month, by The Bramson Publishing Company. Advertising, Editorial and General offices at 2842 West Grand Boulevard, Detroit, Michigan. Telephone MAdison 7553. THE TOOL ENGINEER is the official publication of the American Society of Tool Engineers. Acceptance under the Act of June 5, 1934, at St. Joseph, Michigan, authorized December 18, 1940. Printed in the U. S. of A. Copyright 1941 by The Bramson Publishing Company.

THE BRAMSON PUBLISHING COMPANY, 2842 WEST GRAND BOULEVARD, DETROIT, MICHIGAN

ADVERTISING OFFICES

Chicago, Illinois
Dwight H. Early
100 N. LaSalle Street
CENtral 4158

Detroit, Michigan
Thomas J. Orlando
2842 W. Grand Blvd.
MAdison 7553

Los Angeles, Calif.
Wentworth Green
1709 West 8th St.
EXposition 8292

New York City
A. M. Willcox
420 Lexington Avenue
Lexington 2-4816

Providence, R. I.
Herman T. Pierik
4 Weybosset Street
GAspee 1568

San Francisco, Calif.
Robert W. Walker
68 Post Street
SUtter 6706

What Johansson Gage Blocks mean to Defense Production

FACTORIES and shops engaged in production of precision and interchangeable parts have an accurate, economical and practical gaging system in Johansson Gages and Accessories.

Virtually every measurement of length that is made with commercial measuring tools can be made *more quickly* and *more surely* with this equipment.

Unsurpassed accuracy has established Johansson Gage Blocks as the world's standard of precision measurement.

FORD MOTOR COMPANY

Johansson Division

(Dept. J) Dearborn, Michigan

JOHANSSON GAGE BLOCKS

Frank W. Curtis, President

AMERICAN SOCIETY OF TOOL ENGINEERS

2567 W. GRAND BLVD., DETROIT, MICH.

Ford R. Lamb, Executive-Secretary

O. W. Winter, 1st Vice-President — *F. R. Crone, Treasurer*

Ray H. Morris, 2nd Vice-President — *Clyde L. Hause, Secretary*

BOARD OF DIRECTORS—1940-41

Charles T. Allen
E. B. Barber
Joseph L. Berry
Louis Biehler
J. R. Blank
C. V. Briner
D. D. Burnside
Raymond A. Cole
Clarence E. Cook
Frank R. Crone
Frank W. Curtis
A. H. d'Arcambal
John C. Dense
E. W. Dickett
F. J. Diehl
Floyd E. Doty, Jr.
Thomas P. Orchard
Floyd W. Eaton
A. D. Forbes
W. T. Forde
Paul W. Frankfurter, Sr.
W. J. Frederick
R. J. Freter
George Goodwin
W. T. Gray
Clyde L. Hause
Harold L. Heywood
H. D. Hiatt
Carl W. Horack
George J. Keller
Nils H. Lou
Kenneth W. Lund
Joseph B. Morganthall
W. B. Pierce
Lorence E. Rennell
Arnold Thompson
James R. Weaver
Ray Wentzler
George W. Wise
Frederic L. Woodcock
Adolph Zaborowski

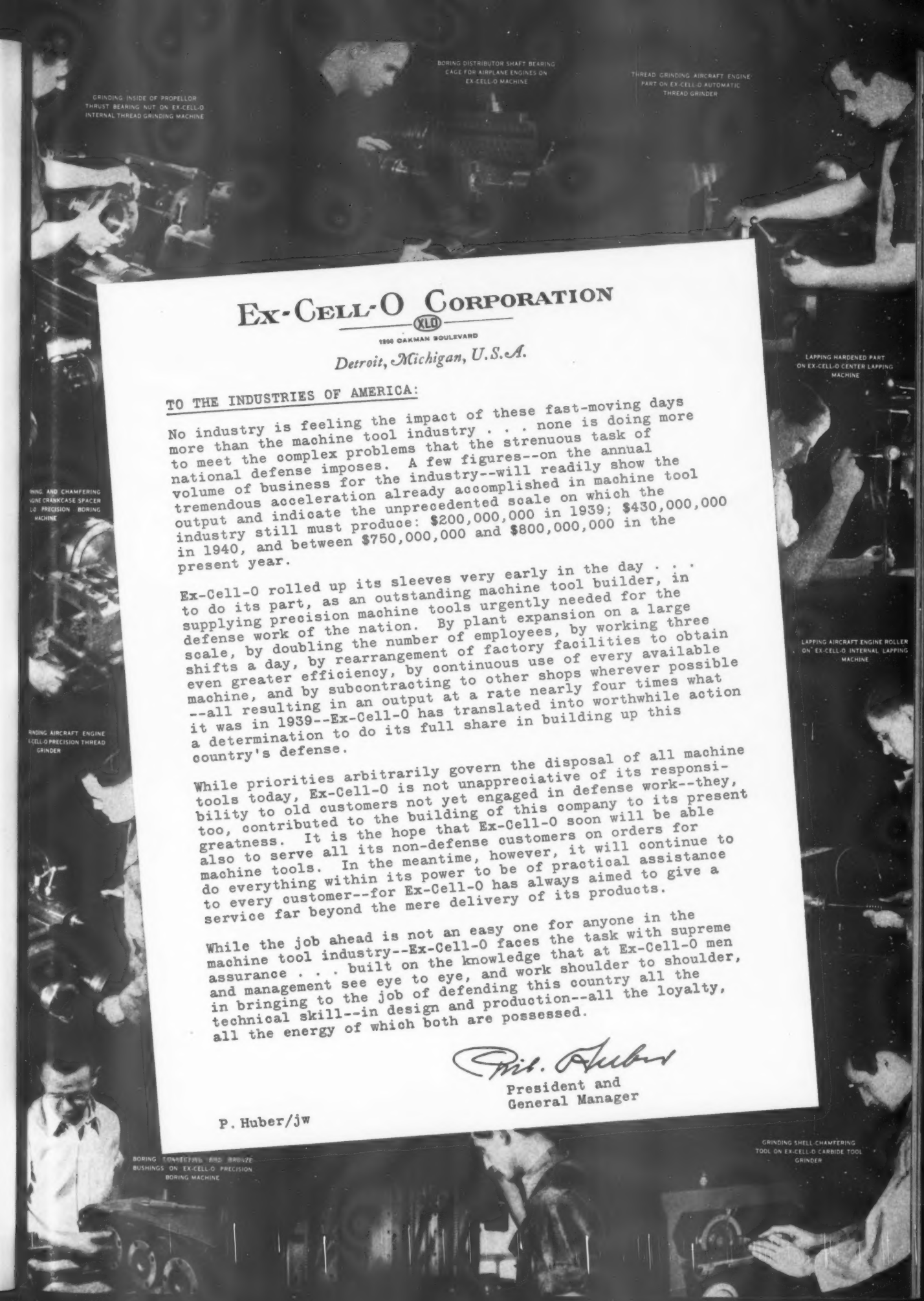
NATIONAL COMMITTEE CHAIRMEN

Industrial Relations — E. A. Rutzen
New Chapters — R. T. Bramson
Membership — E. W. Dickett
Standards — E. W. Ernst
Editorial — I. F. Holland
Publicity — C. B. Cole
Historian — O. B. Jones
Constitution and By-Laws — R. M. Lippard
Educational — H. D. Hall

CHAPTER CHAIRMEN AND SECRETARIES 1941-42

Baltimore: Godfrey F. Steiner, Chairman; L. MacGregor, Secretary, 501 Hollen Road, Baltimore, Md.
Binghamton: Samuel E. Lenox, Chairman; Stanley K. Bishop, Secretary, 23 Howard Avenue, Binghamton, N. Y.
Boston: C. A. Lockwood, Chairman; W. W. Young, Secretary, 238 Main Street, Cambridge, Mass.
Buffalo: Allen C. Siegel, Chairman; William J. Noth, Secretary, 298 Washington Avenue, Kenmore, N. Y.
Chicago: Sven G. Goransson, Chairman; Fred J. Schmitt, Secretary, 2727 S. Troy Street, Chicago, Ill.
Cincinnati: W. D. Averill, Chairman; Roy Holle, Secretary, 1101 Groesbeck Road, Cincinnati, Ohio.
Cleveland: C. V. Briner, Chairman; W. Reiff, Jr., Secretary, 626 Penton Bldg., Cleveland, Ohio.
Columbus: S. J. Matchett, Jr., Chairman; H. T. Spoerlein, Secretary, 601 W. Fifth Avenue, Columbus, Ohio.
Dayton: Herman O. Poock, Chairman; Harry W. Winter, Secretary, 350 Jones St., Dayton, Ohio.
Detroit: B. L. Diamond, Chairman; John Felten, Secretary, 14634 Artesian Avenue, Detroit, Michigan.
Elmira: C. D. Thomas, Chairman; Joseph G. Menihan, Secretary, 171 Cedar St., Corning, N. Y.
(Grand Rapids) Western Michigan: Joseph Monahan, Chairman; E. J. Roosien, Secretary, 1724 Martin Ave. S.E., Grand Rapids, Michigan.
Hamilton: W. A. Dawson, Chairman; Edward L. Greer, Secretary, 77 Pearl St., Burlington, Ontario.
Hartford: Henry I. Moore, Chairman; Harry J. Hauck, Secretary, 22 N. Wellington Street, New Britain, Conn
Houston: L. M. Cole, Chairman; Louis M. Krausse, Secretary, 3903 Almeda, Houston, Texas.
Indianapolis: Ronald W. Updike, Chairman; A. F. Pittman, Secretary, 245 W. 38th St. Indianapolis, Ind.
Los Angeles: Dwight C. Jones, Chairman; H. F. Lenz, Secretary, 4313 Budlong Avenue, Los Angeles, Calif.
Milwaukee: Harold Heywood, Chairman; I. F. Herbes, Secretary, 4616 N. Bartlett Ave., Milwaukee, Wis.
(Minneapolis-St. Paul) Twin Cities: Glen Roberts, Chairman; William E. Boker, Secretary, 3104 Snelling Avenue, Minneapolis, Minn.
(Moline) Tri-Cities: W. Z. Fidler, Chairman; L. J. Rodgers, Secretary, c/o Deere & Mansur, Moline, Illinois.
Nashville: H. T. Sprott, Chairman; Leo V. Johnston, Sr., Secretary, 1000 Mile End Ave., Nashville, Tennessee.
(New Haven) Southern Connecticut: Harry J. Bellemore, Chairman; A. H. Hitchcock, Secretary, c/o High Standard Mfg. Co., New Haven, Conn.
(New York) Greater: Thomas P. Orchard, Chairman; John J. Rodnite, Secretary, c/o D. A. Stuart Oil Co., Grand Avenue & 57th Street, Maspeth, L. I., N. Y.
New York-New Jersey: Frank J. Oliver, Chairman; Ben C. Brosheer, Secretary, 330 West 42nd St., New York, N. Y.
Peoria: Earl J. Kane, Chairman; Levi W. Hammond, Secretary, Terrace View Lane, R.R. 4., Peoria, Ill.
Philadelphia: John A. McMonagle, Chairman; Henry A. Simpson, Secretary, 1011 Chestnut St., Philadelphia, Pa.
Pittsburgh: R. W. Ford, Chairman; W. W. Walters, Secretary, 8019 St. Lawrence St., Swissvale, Pa.
Racine: H. Ernest Munch, Chairman; John Pritchard, Secretary, 1602 Wisconsin Avenue, Racine, Wis.
Rochester: Cecil E. Lucas, Chairman; Milton L. Roessel, Secretary, 97 Biltmore Drive, Rochester, N. Y.
Rockford: Henry F. Buehl, Chairman; George Sorensen, Jr., Secretary, 744 Regan St., Rockford, Ill.
(San Francisco) Golden Gate: Karl L. Bues, Chairman; L. A. Talamini, Secretary, 2518 64th Ave., Oakland, Calif.
Schenectady: A. Schuneman, Chairman; N. Y. Coxe, Secretary, Bldg. 41, Rm. 235., G. E. Co., Schenectady, N. Y.
Seattle: W. Carl Fields, Chairman; Richard J. McCafferty, Secretary, 230—16th Ave., N., Apt. 102, Seattle, Wash.
South Bend: Horace R. Wentzell, Chairman; Eugene J. Hill, Secretary, 120 W. Colfax Avenue, South Bend, Ind.
Springfield, Mass.: Michael Brennan, Chairman; William Suk, Secretary, 95 State Street, Springfield, Mass.
(Springfield, Vt.) Twin States: Wilbur Handy, Chairman; P. C. Deerland, Secretary, 32½ Summer Hill, Springfield, Vt.
St. Louis: D. D. Burnside, Chairman; Clarence L. Miller, Secretary, 4245 Forest Park Avenue, St. Louis, Mo.
Syracuse: T. Ray Adams, Chairman; Raymond D. Cosco, Secretary, 239 Maplehurst, Syracuse, N. Y.
Toledo: Lloyd A. Kelley, Chairman; George B. Staley, Secretary, 134 Poinsette Avenue, Toledo, Ohio.
Toronto: E. Barker, Chairman; L. G. Singer, Secretary, 11 Front St., E., Toronto, Ont., Can.
Worcester: C. John Lindegren, Chairman; Charles A. Banks, Secretary, c/o Heald Machine Co., New Bond St., Worcester, Mass.
(York) Central Pennsylvania: Hallet D. Jones, Chairman; Herbert M. Boyer, Secretary, 320 Garfield St., York, Pa.

Application blanks and information pertaining to membership in the American Society of Tool Engineers may be had by addressing The Tool Engineer, 2842 W. Grand Blvd., Detroit, Mich., or the Secretary's office, 2567 W. Grand Blvd., Detroit, Mich. Dues are $5 initiation fee, $6 per year for senior grade membership and $3 per year for junior grade membership. Junior membership initiation fee $2.


GRINDING INSIDE OF PROPELLOR THRUST BEARING NUT ON EX-CELL-O INTERNAL THREAD GRINDING MACHINE
BORING DISTRIBUTOR SHAFT BEARING CAGE FOR AIRPLANE ENGINES ON EX-CELL-O MACHINE
THREAD GRINDING AIRCRAFT ENGINE PART ON EX-CELL-O AUTOMATIC THREAD GRINDER
LAPPING HARDENED PART ON EX-CELL-O CENTER LAPPING MACHINE
LAPPING AIRCRAFT ENGINE ROLLER ON EX-CELL-O INTERNAL LAPPING MACHINE
GRINDING SHELL-CHAMFERING TOOL ON EX-CELL-O CARBIDE TOOL GRINDER
BORING CONNECTING ROD BRONZE BUSHINGS ON EX-CELL-O PRECISION BORING MACHINE

EX-CELL-O CORPORATION

XLO

1200 OAKMAN BOULEVARD

Detroit, Michigan, U.S.A.

TO THE INDUSTRIES OF AMERICA:

No industry is feeling the impact of these fast-moving days more than the machine tool industry . . . none is doing more to meet the complex problems that the strenuous task of national defense imposes. A few figures--on the annual volume of business for the industry--will readily show the tremendous acceleration already accomplished in machine tool output and indicate the unprecedented scale on which the industry still must produce: $200,000,000 in 1939; $430,000,000 in 1940, and between $750,000,000 and $800,000,000 in the present year.

Ex-Cell-O rolled up its sleeves very early in the day . . . to do its part, as an outstanding machine tool builder, in supplying precision machine tools urgently needed for the defense work of the nation. By plant expansion on a large scale, by doubling the number of employees, by working three shifts a day, by rearrangement of factory facilities to obtain even greater efficiency, by continuous use of every available machine, and by subcontracting to other shops wherever possible --all resulting in an output at a rate nearly four times what it was in 1939--Ex-Cell-O has translated into worthwhile action a determination to do its full share in building up this country's defense.

While priorities arbitrarily govern the disposal of all machine tools today, Ex-Cell-O is not unappreciative of its responsibility to old customers not yet engaged in defense work--they, too, contributed to the building of this company to its present greatness. It is the hope that Ex-Cell-O soon will be able also to serve all its non-defense customers on orders for machine tools. In the meantime, however, it will continue to do everything within its power to be of practical assistance to every customer--for Ex-Cell-O has always aimed to give a service far beyond the mere delivery of its products.

While the job ahead is not an easy one for anyone in the machine tool industry--Ex-Cell-O faces the task with supreme assurance . . . built on the knowledge that at Ex-Cell-O men and management see eye to eye, and work shoulder to shoulder, in bringing to the job of defending this country all the technical skill--in design and production--all the loyalty, all the energy of which both are possessed.

P. Huber

President and
General Manager

P. Huber/jw

O.P.M. orders conservation of TUNGSTEN

...during any three months period, effective June 1st, a customer for High Speed Steel shall place, and a producer accept, orders for Tungsten Steel only to an extent that he orders an equal amount of Molybdenum High Speed Steel which contains less Tungsten.

CRUCIBLE STEEL COMPANY of America
CHRYSLER BUILDING, New York, N. Y.

Gentlemen:

Please send me a copy of the following Pamphlets.

☐ REX VM ☐ REX MM ☐ REX TMO

Name..... Title.....

Firm Name.....

Address.....

City..... State.....

SEND FOR THES

Free Pamphl

Crucible has prepa technical pamphlets REX VM, REX MM REX TMO containing c plete heat treating d Write for these pamph and have the facts on h for ready reference.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

.. And Crucible is prepared

TO COOPERATE WITH ESTABLISHED REX HIGH SPEED STEELS OFFERING MAXIMUM CONSERVATION . . .

Realizing the future strategic importance of Molybdenum High Speed Steels, Crucible started many years ago to develop, test and gradually introduce them to the trade. The O. P. M. order, therefore, finds Crucible prepared to help you cooperate in the interests of national defense by offering you the following three established grades:—

REX VM (8% Mo, 4% Cr, 2% V, .85 C), is primarily recommended for twist drills, taps, hack saws and slitting saws. It is also suitable for lathe, planer and boring tools, chasers, reamers, hobs and milling cutters. *This grade contains no Tungsten.*

REX MM (5.50% W, 3.75% Mo, 4% Cr, 1.50% V, .80 C), is the general-purpose substitute for Rex AA and is recommended for lathe, planer and boring tools, reamers, hobs, milling cutters, drills and taps.

REX TMO (1.50% W, 8.75% Mo, 3.75% Cr, 1.10% V, .80 C), is recommended for twist drills, taps, lathe, planer and boring tools, reamers, hobs and milling cutters.

Let Crucible Help You Change Over

Get in touch with your nearest Crucible office immediately. Ask them to send you a Crucible Steelman to explain the application of the O. P. M. order to your steel requirements. Let the Crucible Steelman show you how one or more of these three grades, REX VM, REX MM or REX TMO, will enable you to maintain your continuous flow of vital production . . . without time-consuming experiments or interruptions.

Call Crucible today!

SPECIALTY STEELSMITHS to INDUSTRY

CRUCIBLE STEEL COMPANY of America

CHRYSLER BUILDING • 405 LEXINGTON AVENUE • NEW YORK CITY
BRANCHES, WAREHOUSES AND DISTRIBUTORS IN PRINCIPAL CITIES

MAKERS OF HIGH SPEED, TOOL, STAINLESS, ALLOY, PRODUCTION AND SPECIAL PURPOSE STEELS

BRANCH OFFICES AND WAREHOUSES

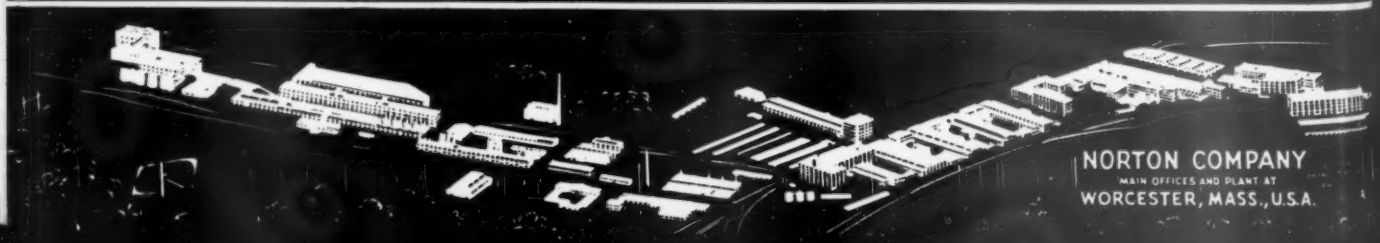
ATLANTA, GA.
BALTIMORE, MD.
BOSTON, MASS.
BUFFALO, N. Y.
CHICAGO, ILL.
CINCINNATI, OHIO
CLEVELAND, OHIO
DENVER, COLO.
DETROIT, MICH.
INDIANAPOLIS, IND.
LOS ANGELES, CALIF.
MILWAUKEE, WIS.
NEWARK, N. J.
NEW HAVEN, CONN.
NEW YORK, N. Y.
PHILADELPHIA, PA.
PITTSBURGH, PA.
PROVIDENCE, R. I.
ST. LOUIS, MO.
ST. PAUL, MINN.
SAN FRANCISCO, CALIF.
SEATTLE, WASH.
SPRINGFIELD, MASS.
SYRACUSE, N. Y.
TORONTO, ONT.
WASHINGTON, D. C.

GRINDING WHEEL PRODUCTION
Hitting on HIGH!

IN 1920 Norton built the first tunnel kiln in the abrasive industry, three more in 1928, 1936 and 1937. The fifth, just completed, will be fired this month.

The greatly increased kiln capacity and additional manufacturing facilities were ready in time to help meet the increasing grinding wheel demands of the defense industries.

NORTON ABRASIVES

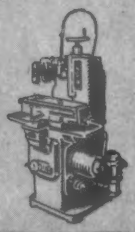


NORTON COMPANY
MAIN OFFICES AND PLANT AT
WORCESTER, MASS., U.S.A.

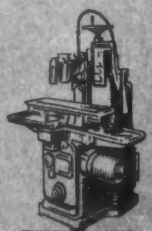
Engineered Production

One of the Reasons

Diagram at left shows one of many reasons for Sundstrand Automatic Stub Lathe speed . . . No cycle-control cams to make or mount, merely adjust dogs on convenient graduated disc. See details in Bulletin 391.



No. 00 Rigidmil



No. 0 Rigidmil

No. 1 Rigidmil

On WRIGHT Miscellaneous Shafts

Shown in panel above are four typical work-pieces from the miscellaneous shaft department of Wright Aeronautical Corporation, Paterson, N. J., where a wide variety of work is turned to high standards of accuracy and finish. Engineered Production and Sundstrand Automatic Stub Lathes increased output on these pieces an average of 56%, and give equally satisfactory service on a large number of other jobs.

The easy set-up and quick change-over of Sundstrand Automatic Lathes provide high production and economy on small-lot work. For example, Model 8 shown above does two sets of operations on pump shafts. Twenty to 25 minutes suffice for changing from one group of operations to the other. Setting up for new jobs is rapid because Sundstrand Automatic cycles are established quickly by adjusting dogs on a convenient graduated disc; large numbers of speeds, feeds and cycles are available for quick, easy selection; Sundstrand standard tool blocks, and micrometer adjustments of tool slides, save time.

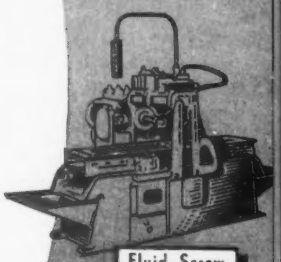
On mass production, Sundstrand Automatic Lathes have power, strength and rigidity to work high-speed cutting tools at maximum capacity in any metal; and stamina to keep on running steadily in such service, with minimum maintenance.

On all their work, Sundstrand Automatic Stub Lathes swing into high production quickly. Their operators need no special skill, little preliminary training; can work full shifts efficiently without excessive fatigue.

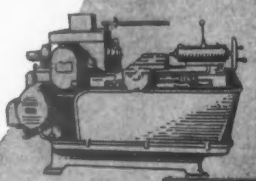
★ For high production on today's turning, take full advantage of your Sundstrand Automatic Stub Lathe qualities. For speed on next year's turning, order your Sundstrand Automatic Stub Lathes now. For best results any time on manufacturing turning or milling, use Sundstrand Engineered Production.

Get This Bulletin

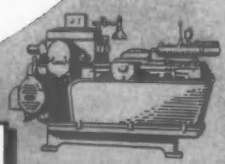
Bulletin 391 shown above contains detailed descriptions and data on Automatic Stub Lathes. Write for your copy, today.



Fluid-Screw Rigidmil



Model 12 Automatic Stub Lathe



Model 10 Automatic Stub Lathe

Model 8 Automatic Stub Lathe

In their respective fields, Sundstrand machine tools are unexcelled for high production, accuracy, and lasting value. Write for complete details.

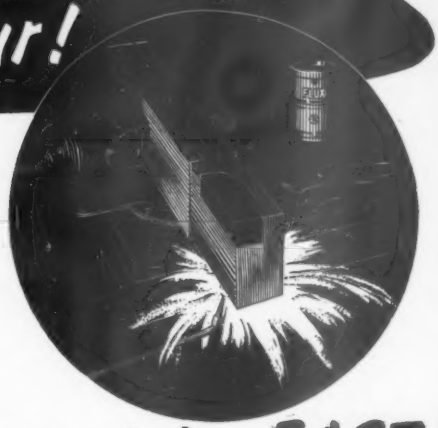
Sundstrand Machine Tool Co.

2532 Eleventh Street, Rockford, Illinois, U. S. A.

RIGIDMILS · STUB LATHES

Hydraulic Operating Equipment — Drilling and Centering Machines

From Blueprint To "Tool-up" In Less Than 1 Hour!

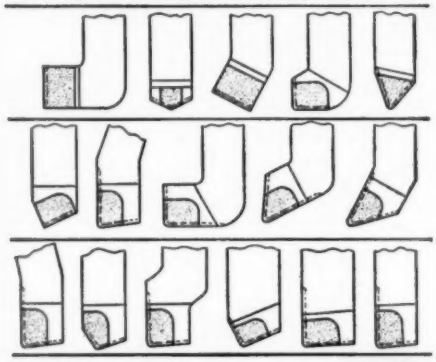


Braze Your Own Carboloy Tools . . . Get Them On Emergency Jobs *FAST!*

Emergency periods call for quick action. When a job must get under way fast—when you need Carboloy tools "yesterday"—*why not braze your own Carboloy tools?* . . . It's a simple short cut that eliminates ordering time and avoids routine "hold ups" awaiting deliveries.

Many plants now keep a stock of Carboloy Standard Blanks in their tool crib . . . ready, on a moment's notice, to make up a tool and get it on the job *fast!* . . . less than an hour for most single-point, straight-shank tools!

A Few Typical Tools You Can Make ...Using Carboloy STANDARD BLANKS



CARBOLOY STANDARD BLANKS ARE AVAILABLE IN 2 STYLES, 65 SIZES AND 3 GRADES

STYLE 100

STYLE 200

Just three simple steps are necessary to do this in your tool room.

1. Preparing Recess in Shanks

To accommodate the Carboloy blank in your tool shank it is necessary to provide a recess in which the Carboloy Blank can be inserted. This is a simple operation that can be done on your regular tool room milling or grinding equipment.

2. Brazing Carboloy Blank to Shank

Brazing the Carboloy Blank to your shank requires less than 5 minutes on most straight-shank, single-point tools. To do this you simply need a torch, and a few inexpensive accessories: Silver solder, flux, carbon tetrachloride, etc.

3. Grinding the Brazed Tool

Simple—fast—as easy as regrinding dull carbide tools, using the now-established, rapid grinding technique, and your regular carbide grinding equipment.

With these three simple steps you're prepared to meet emergency requirements immediately. Why wait—when you can get tools on the job *FAST*—by this simple procedure? Write for instruction booklet GT-116.

CARBOLOY COMPANY, INC.

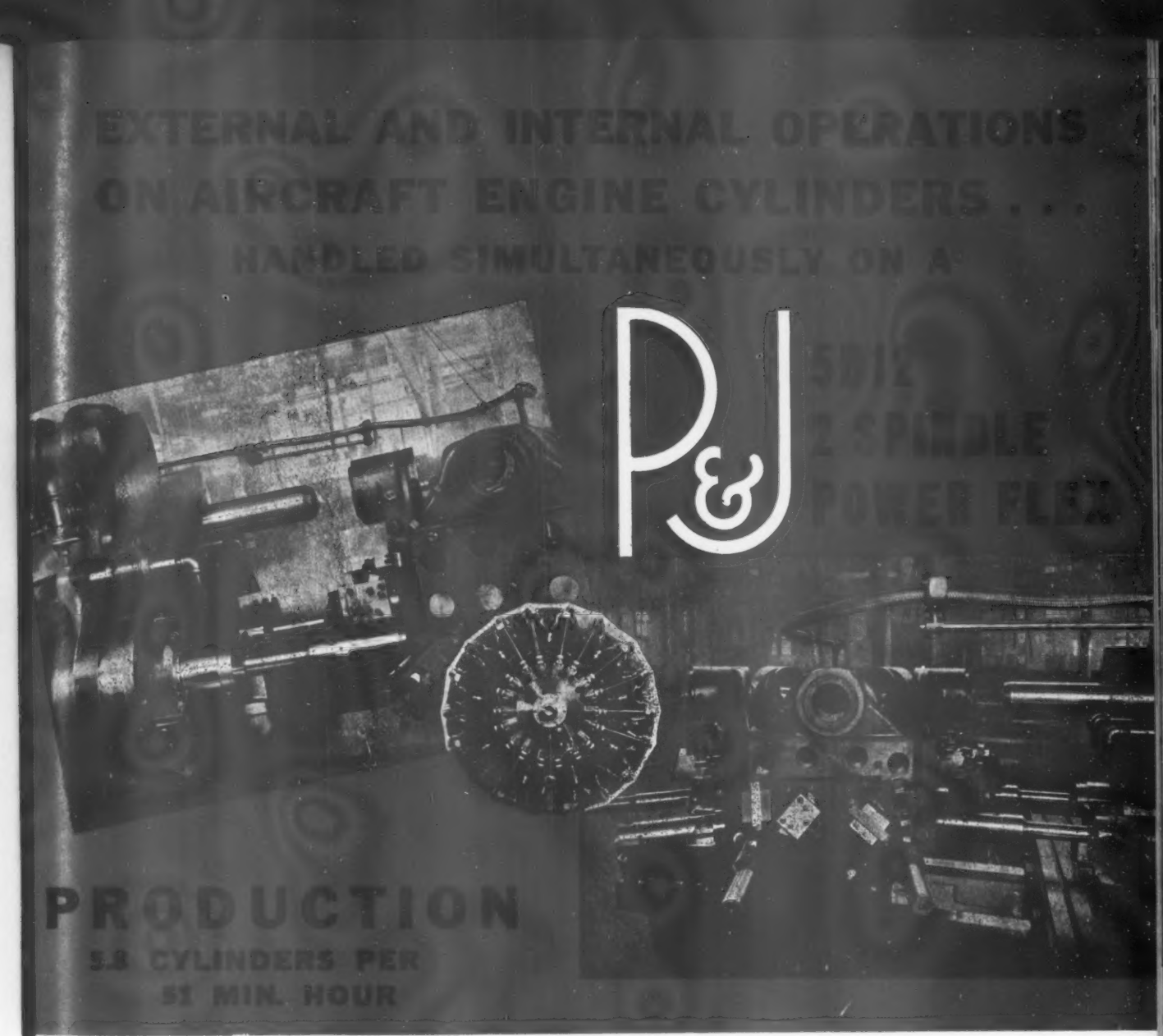
11145 E. 8 MILE ST., DETROIT, MICH.

Chicago • Cleveland • Los Angeles • Newark
Philadelphia • Pittsburgh • Worcester

Canadian Distributor:
Canada General Electric Co., Ltd., Toronto, Canada

CARBOLOY
Reg. U. S. Pat. Off.

STANDARD STOCK BLANKS
2 STYLES • 65 SIZES • 3 GRADES



Through the use of special tooling and a rigid type of overhead pilot, this two spindle P & J machine set up in the plant of Lycoming Division, Aviation Manufacturing Corp., Williamsport, Pa., is an outstanding contribution to aircraft cylinder production.

Tooling for first or internal operation is mounted on turret in alignment with rear spindle while second or external operation is tooled up in alignment with front spindle. The two holdings (one on each subject) are performed simultaneously, with a three jaw chuck and an air operated fixture on rear and front spindles respectively. One cycle of machine brings the rough machined steel forgings up to the finning operation handled on another type machine.

In addition to high productive capacity, the P & J Automatic assures flexibility, ease of change over, minimum floor space, low power consumption, rigidity and high finish accuracy. Many modern features of the 5D12 Power-Flex provide a machine which is ideal for aircraft engine work demanding economical production, extremely fine finish, accuracy and heavy cutting under continuous operation.

One operator can readily handle two or even three machines on this class of work.

OPERATIONS PERFORMED

REAR SPINDLE: (Presenting thread end to spindle).

1st T. F.—Loading Bar.

2nd T.F.—Rough bore hole half way; rough turn 4.75"—4.841 dia.; rough face end; rough turn and straddle face flange; rough form groove.

3rd T. F.—Semi-finish above cuts; chamfer.

4th T. F.—Size turn 4.841" dia.

5th T.F.—Unloading.

FRONT SPINDLE: (Presenting finished end to spindle. Locate in ring on 4.841" dia. and hold back against hardened and ground steel plate with 3 air operated fingers or clamps over flange).

1st T.F.—Loading.

2nd T.F.—Rough bore hole half way; rough turn and face finished dia.; rough turn thread dia.; rough face end.

3rd T.F.—Semi-finish above cuts; chamfer corners; turn 4.910" dia.; bore hole through.

4th T.F.—Ream hole 4.608" dia. through.

5th T.F.—Unloading bar.

POTTER & JOHNSTON MACHINE CO. PAWTUCKET RHODE ISLAND

"All Aid to Tool Making"

This is Carpenter's policy—and it's backed up by the specific helps illustrated, to increase your output from present equipment.

FOR THE TOOL ROOM

Quickly and accurately, this Wall Chart Tool Steel Selector helps you get the right tool steel for the job. Hundreds are now in use—saving time and money and conserving materials in America's tool rooms.

FOR TOOL ENGINEERS

A 157-page Manual with complete new quick reference tool index and Tool Steel Selector. Valuable as a guide in selecting the right steel for the job. Also included in the Manual are detailed heat treating data and hardening instructions.

$1.00 U. S. A. POSTPAID

FOR TRAINING PROGRAMS

More than 20,000 copies of this 315-page handbook, "Tool Steel Simplified", are in use by tool engineers, tool makers, apprentices and vocational schools. Ideal to meet present training problems. Price $1.00 in U. S. A.

Take full advantage of this useful information now. Your Carpenter representative will be glad to see that you get copies, or write us on your company letterhead. The handbook, "Tool Steel Simplified," costs $1.00. The other literature is free to tool steel users in the U. S. A.

THE CARPENTER STEEL COMPANY
122 BERN STREET, READING, PA.

BETTER TOOLS CONSERVE VITAL MATERIALS

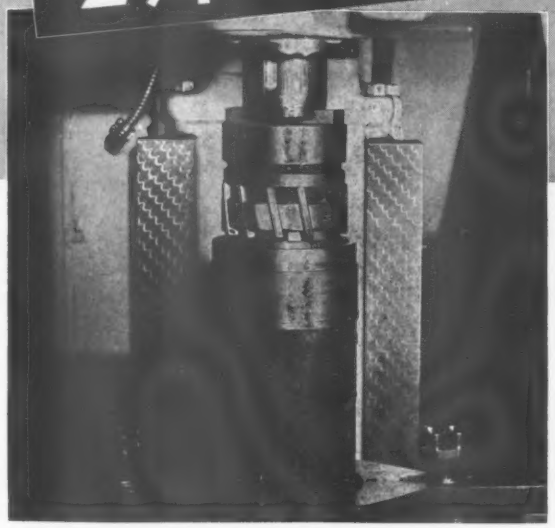
*FREE to tool steel users in U.S.A.

Carpenter MATCHED TOOL STEELS

In the Spotlight

HIGH SPEED PRECISION REAMING

5¾" x 15" Cylinder Liners REAMED IN 2¼ MINUTES Floor-to-Floor



...with BARBER-COLMAN INSERTED BLADE REAMER

Reaming 15" long Diesel cylinder liners on a production basis, holding accuracy on diameter, straight and parallel, is a difficult problem in any shop. Yet Barber-Colman Inserted Blade Reamers do just this in 2¼ minutes floor-to-floor time.

The Reamer has irregular-spaced, cemented carbide tipped blades, and produces an average of 2000 — 5¾" diameter liners per sharpening.

This special application of B-C Inserted Blade Reamers is another typical example of where B-C Reamer engineering service solved a difficult machining problem. You, too, can get high speed precision reaming like this with B-C Inserted Blade Reamers. A field engineer will gladly call and discuss your requirements with you upon your request, and without obligation.

● **B-C Inserted Blade Reamers provide exclusive advantages including the wedge and pin method of blade mounting, which gives a solid foundation support from one end of blade to the other to prevent tipping when the blade overhangs the body. Irregular blade spacing eliminates chatter. Built-in lateral float mounted on hardened rollers maintains parallel alignment and prevents back scoring.**

THIS OPERATION IN BRIEF

Tool — Barber-Colman Cemented Carbide Tipped Inserted Blade Cylinder Reamer with lateral float mounting.

Part — Cylinder liner for Diesel tractor engine.

Material — Cast iron alloy.

Operation — Ream cylinder 15" long from 5.730"-5.735" bored diameter to 5.745"-5.747" diameter.

Machine — Colburn Heavy Duty Drill Press.

Holding — Fixture locates on turned diameter, and clamps on flange.

Feed — 0.402" per revolution . . . Speed — 32 r.p.m.

Production time — 2¼ minutes floor-to-floor.

Accuracy — Hold −0.000" + 0.002" on diameter, straight, and parallel.

Pieces per Sharpening — 2000.

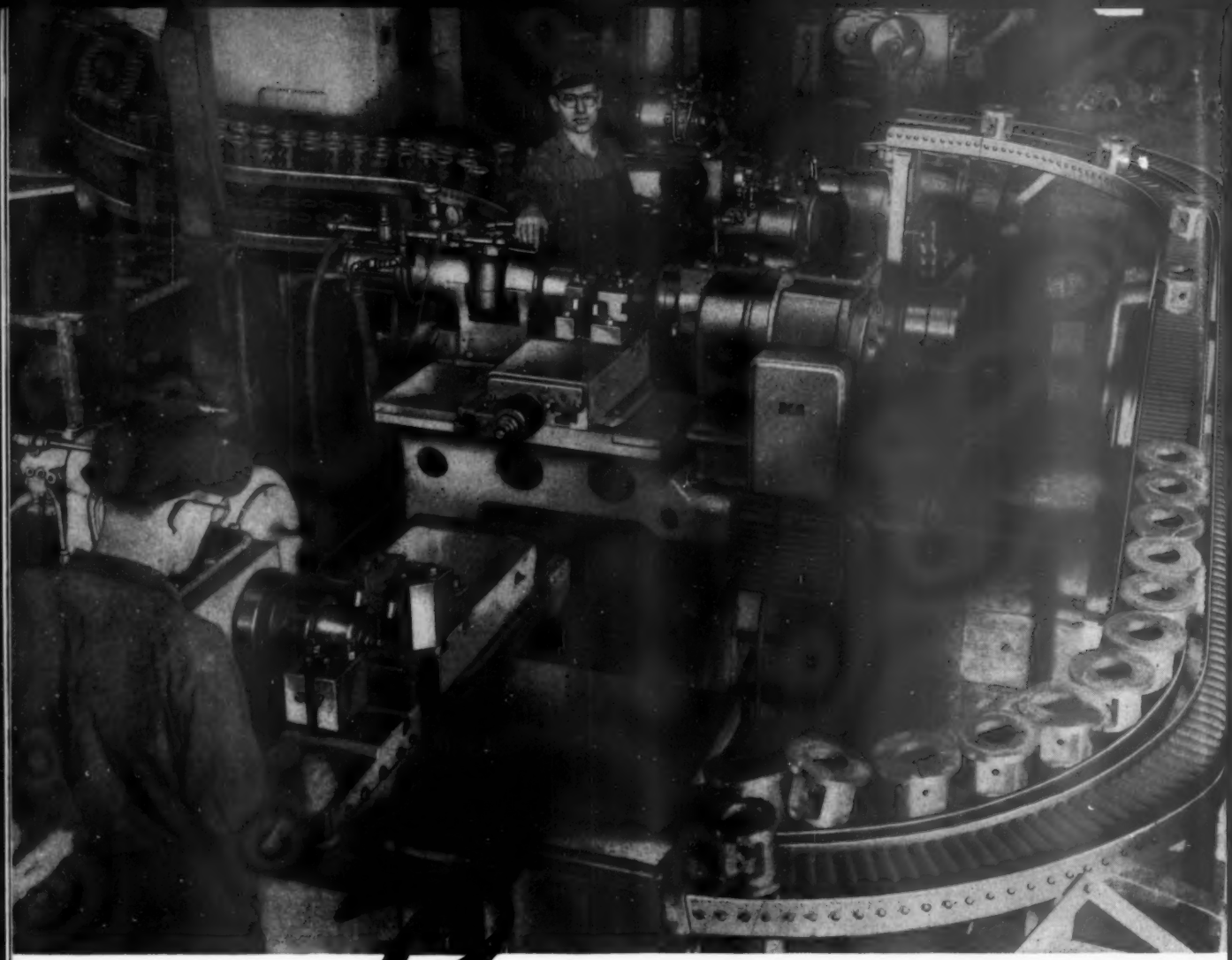
BARBER B-C COLMAN

PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

General Offices and Plant 213 Loomis St., Rockford, Illinois, U. S. A.



THIS IS *Production* IN 1941

WITH GISHOLT HYDRAULIC AUTOMATIC LATHES

● You'll see the quickened tempo of today's production in these new Gisholt Hydraulic Automatic Lathes. There's no waste motion — no lost time — no great degree of skill required. With all functions controlled by one simple lever, the operator has only to start the machine, and chuck and unchuck the work. All other operations are fully automatic — parts are machined at high speeds with precision and fine finish. Here, four of these Gisholt No. 12 Hydraulic Automatic Lathes, served by roll conveyors, turn out crawler track bushings continuously, 24 hours a day, in lots of 11,000.

In the machining of a wide variety of cylindrical parts, time and cost records show that these new Gisholts are saving as much as 80% over former methods. If you have a task that calls for high speed production, ask your nearest Gisholt representative for full information.

GISHOLT MACHINE COMPANY
1229 East Washington Ave., Madison, Wis.

GISHOLT

Look ahead . . . keep ahead . . . with Gisholt improvements in metal turning

SPEEDER LATHES • AUTOMATIC LATHES • BALANCING MACHINES

THE Elliptoid TOOTH FORM

AN IMPORTANT ADVANCE IN GEAR PRACTICE

Gear tooth contact is one of the most important factors in gear operation, efficiency and service. In a large percentage of cases both gear failure and gear noise are the result of deflections or of slight misalignments of gear axes in either the horizontal or the vertical planes.

This trouble is completely eliminated by the use of the ELLIPTOID tooth form which has been developed by Red Ring engineers for both spur and helical gears.

A horizontal section through an accurately formed conventional tooth has sides that are straight. But with the ELLIPTOID tooth the sides are elliptical, thus making the tooth thicker at the center by .0002" than at the edges or wherever it is desired to locate the contact.

This .0002" is well within customary allowable limits for good gear practice, but by the Red Ring method this can be varied to meet various conditions.

It has been discovered that on the basis of the tooth form design in the transmission gearing of five years ago, it is now possible to reduce gear size, weight and cost for any specified loading by reducing the pitch and making the teeth in the ELLIPTOID form.

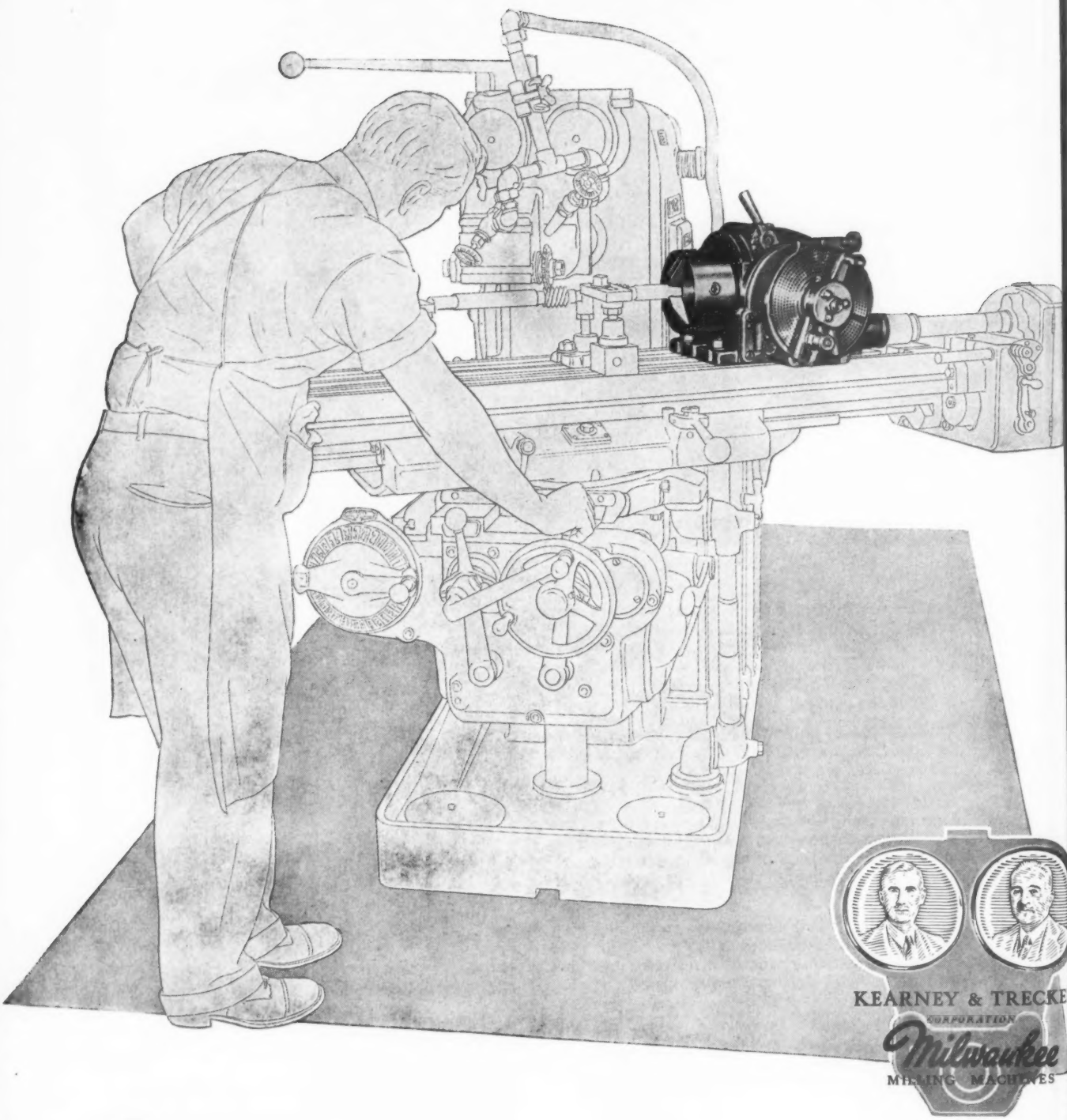
The ELLIPTOID form is produced on the Red Ring Gear Finishing Machine as part of the regular gear shaving operation. It requires no extra machine time, no special skill on the part of the operator. Write for descriptive bulletin.

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT, MICHIGAN

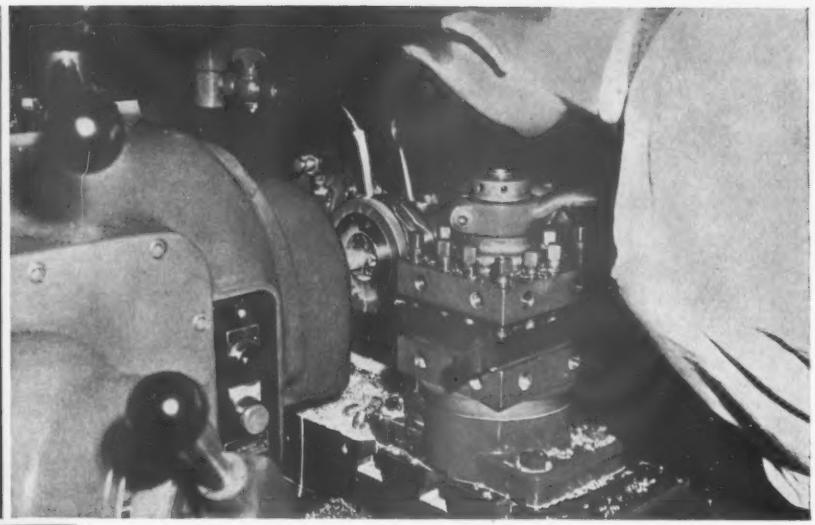
The Model K Spiral Universal Dividing Head — a super-precision dividing instrument is built to provide a long lifetime of production service.

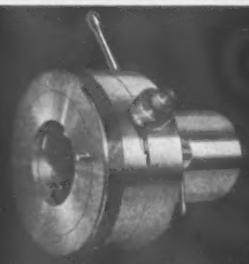
KEARNEY & TRECKER CORPORATION • Milwaukee, Wis., U. S. A.



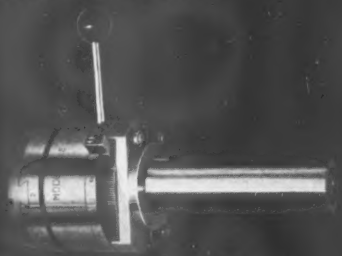
Milwaukee MILLING MACHINES

For the BIG JOB *of* SMALL PARTS





Stationary Radial
Made in Sizes to Cut
Threads from 6-32 to 3".



Stationary Tangent
Made in Sizes to Cut
Threads from 6-32 to 2".

Revolving Tangent
Made in Sizes to Cut
Threads from 6-32 to 2".

Jones & Lamson Die Heads are also made in Revolving radial and in Tangent revolving and stationary types, for use on any type or make of threading machine.

JONES & LAMSON SELF-OPENING RADIAL CHASER TYPE DIE HEADS

MAKE sure of low cost, high volume production of accurate threaded parts with Jones & Lamson High Speed, Self-opening Die Heads.

No other die heads are so well designed for heavy duty, high speed work, and no others give comparable accuracy of diameter, lead and form.

Write today for illustrated booklet No. 139, Jones & Lamson High Speed Series Dies. It gives detailed, graphic information about vital threading work.

J O N E S &
L A M S O N
M A C H I N E C O M P A N Y

PROFIT PRODUCING MACHINE TOOLS

Springfield, Vermont, U. S. A.

Manufacturers of Saddle & Ram Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Tangent and Radial, Stationary and Revolving Dies and Chasers

For Quick Powerful Clamping

Use This WX Sundstrand Hydraulic Pumping Unit

Many tough problems in machine design or operation can be solved most effectively by using WX Sundstrand Hydraulic Pumping Units, with direct or remote controls. Made in seven sizes; these Units each contain two Rota-Roll Pumps, the larger for rapid movement, the smaller for maintaining steadily any desired pressure up to 1000 pounds a square inch.

Rota-Roll Pump . . . Simple, precise, highly efficient; the Rota-Roll Pump has only two moving parts, a roller turning in positive contact with a rotor which runs at reduced speed. Pumping is smooth; operation reliable; friction, wear, and sound practically eliminated.

Integral Valves . . . 4-way valve governing direction of movement in actuated part, "dumping" valve for instant automatic transfer from rapid movement to sustained set pressure, regulating valve adjustable to any desired pressure up to 1000 pounds a square inch, are integral parts of the Unit.

Oil Temperature Reduction . . . Pumping only a small quantity of oil to maintain high pressure reduces by-passing and operating temperature of oil.

Power Saving . . . Use of two highly efficient Rota-Roll Pumps for separate functions saves power throughout entire operation of Unit.

Easy Installation, Simple Piping . . . Compact, WX Pumping Units can be installed easily almost anywhere, require only two pipes connected to cylinder or other actuated element.

Convenient Control . . . Direct or remote controls, for manual or mechanical operation, are available for WX Pumping Units.

See Bulletin . . . Complete information about WX Sundstrand Hydraulic Pumping Units is contained in Bulletin WX-1 . . . write today for your copy. Proposals on specific applications prepared promptly on receipt of complete data.

APPLICATIONS

RIVETERS
FIXTURES
CHUCKS
BRAKES
CLUTCHES
OVERARMS
SADDLES
SLIDES

. . . and any mechanical device in which it is desired to have rapid movement of any element followed instantly by sustained pressure in any amount up to 1000 pounds per square inch.

The Rota-Roll Pumps used in Sundstrand Hydraulic Units are patented and manufactured only by Sundstrand.

Sundstrand Pump Division

2560 Eleventh Street, Rockford, Illinois, U. S. A.

TIPPED TOOLS of FABRICATED STELLITE

SHELL END MILLS
CORE DRILLS
MILLING CUTTERS
COUNTERBORES
WEAR STRIPS
SPECIAL TOOLS

For faster milling of cast iron with more pieces per grind, this new series of brazed rigid toothed cutters can be operated at surface speeds of 120 to 170 feet per minute with a chip load of .005 to .010 inch per tooth.

A tough alloy steel body provides solid support to the Stellite blades.

Stellite Wear Strips are recommended for furnishing a means of holding pilot size throughout the service life of a tool.

LONGER LIFE — HIGHER PRODUCTION — FEWER GRINDS
HEAT RESISTANT — RIGID CONSTRUCTION

SCULLY-JONES AND COMPANY

1901 SO. ROCKWELL ST., CHICAGO, ILLINOIS

"LOGAN"

HYDRAULIC EQUIPMENT

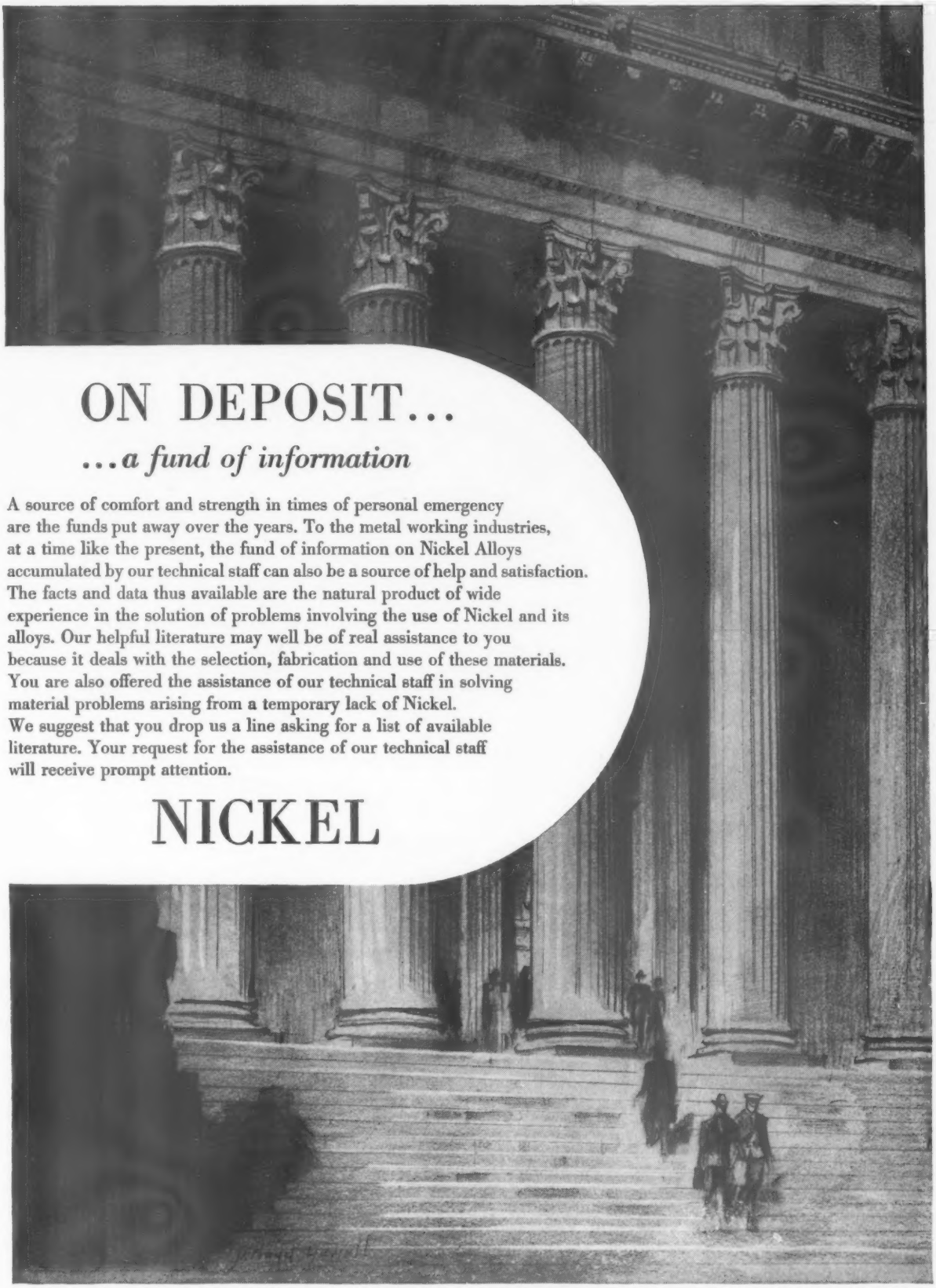
As applied to Warner & Swasey Turret Lathe

This Heavy Duty Warner and Swasey Turret Lathe is equipped with a special holding fixture and "LOGAN" Hydraulic Equipment to guarantee positive chucking pressure under heavy feeds. 16 inch projectiles are completely machined on this turret lathe. The "LOGAN" Hydraulic Power Unit at the left is an entirely independent source of fluid power supply, assuring continuous operation. In addition to the power unit, the chucking equipment consists of a 20 inch "LOGAN" Rotating Type Hydraulic Cylinder, a 28 inch "LOGAN" American Standard Chuck, a "LOGAN" 4095 Hydraulic Control Valve, Pressure Regulating Valve, etc. This heavy duty "LOGAN" equipment assures rigidity and accuracy in machining large steel forgings. Let "LOGAN" Sales Representatives and "LOGAN" Engineers make recommendations on your problems.

LOGANSPORT MACHINE, INCORPORATED

902 Payson Road - - - - - Logansport, Indiana

Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories



ON DEPOSIT...

...a fund of information

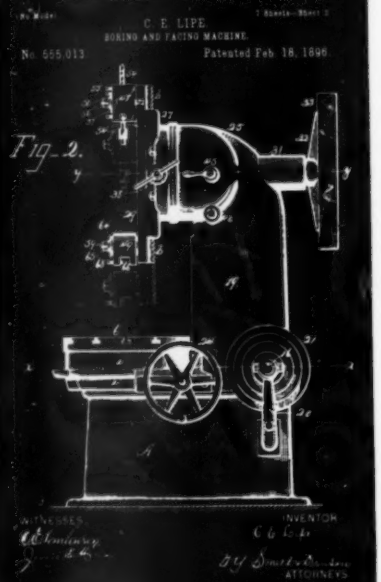
A source of comfort and strength in times of personal emergency are the funds put away over the years. To the metal working industries, at a time like the present, the fund of information on Nickel Alloys accumulated by our technical staff can also be a source of help and satisfaction. The facts and data thus available are the natural product of wide experience in the solution of problems involving the use of Nickel and its alloys. Our helpful literature may well be of real assistance to you because it deals with the selection, fabrication and use of these materials. You are also offered the assistance of our technical staff in solving material problems arising from a temporary lack of Nickel.
We suggest that you drop us a line asking for a list of available literature. Your request for the assistance of our technical staff will receive prompt attention.

NICKEL

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

PATHWAYS TO PROGRESS

Back in 1896



The Forerunner of the Modern VERTICAL BORING and FACING Machine

Almost a half-century ago, the mechanical skill and inventive resource of the Lipe organization was making itself felt. In February, 1896, a patent granted to C. E. Lipe foreshadowed modern boring and facing machine design — design that eliminated the old top-heavy construction and practically removed tool chatter and out-of-true. Its two major features were:

1. the work was secured upon a horizontal rotating table.

2. the tool was mounted in a reciprocating holder, fed both laterally and vertically.

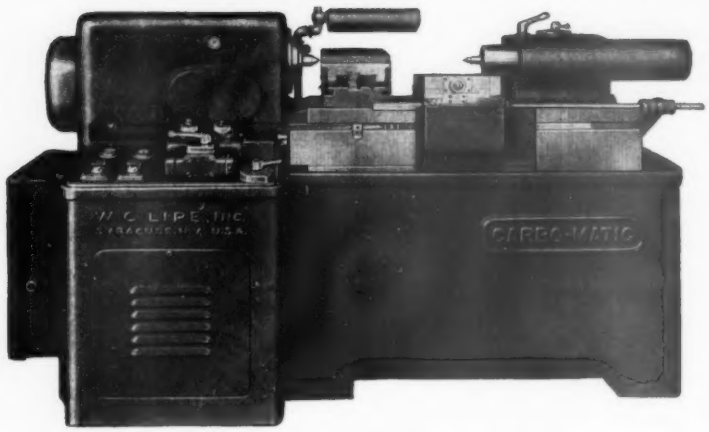
A Development of

LIPE

ENGINEERING and MECHANICAL SKILL

Today

... the LIPE *fully hydraulic* Carbo-Matic Lathe



IT'S a far cry from the simple machine work of 1896 to the complex production problems of 1941, but Lipe engineering still keeps a jump ahead of the primary need. And today's Lipe Carbo-Matic lathe provides the high spindle speeds, the brute power and the combined strength and rigidity necessary for efficient operation with modern carbide tools.

Lipe Carbo-Matic lathes not only give you faster cutting, not only reduce your spoilage and tool grinding—even with the hard, tough alloy steels used in modern armament production—but they permit maximum profits on your increased output. That's because Lipe's fully-automatic, fully-hydraulic Carbo-Matic needs no extra complement of skilled men. Instead, one set-up man can care for a battery of these higher-production machines, and semi-skilled workers can do the loading and unloading.

For the Lipe Carbo-Matic is fully automatic in both the turning cycle and tool relief. More, it has the super-power and super-rigidity necessary to "hog off" tough steels to four decimal accuracy. In short, the ability to meet industry's principal problem of increasing output without increased plant space or large-scale hiring. Write today for specifications and detailed description. New manufacturing facilities, now in operation, assure reasonably prompt delivery dates.

W. C. LIPE, INC.

SYRACUSE, N. Y. U. S. A.

ASSEMBLE them in your own tool room

...A tool on hand is worth two on order

Today, when the demand for carbide tools exceeds tool makers' capacity, there *is* a way to avoid delayed delivery. The "parts" from which FIRTHITE (Sintered Carbide) Cutting Tools are made are *immediately* available! The *assembly* of these "parts" (a carbide tip plus a steel shank) can be quickly completed *in your own tool room by your own machinists!* Only three basic operations are required.

A range of shapes and grades of FIRTHITE TIPS in 249 sizes is ready for *prompt* delivery for your own assembly. Join the increasing number of manufacturers who get carbide cutting tools *when* they want them by this FAST, SURE method or

SEE YOUR LOCAL TOOL MAKER

In many conveniently located cities local tool makers have been authorized to make Carbide Cutting Tools from genuine FIRTHITE materials. Names of reputable tool makers in *your* locality furnished upon request.

1. RECESS the tool steel shank to take FIRTHITE TIP.

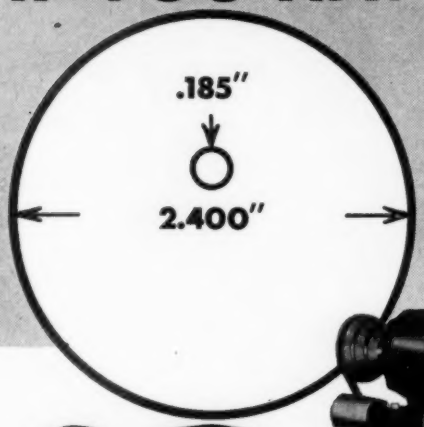
2. BRAZE the FIRTHITE TIP into place with a torch or brazing furnace

3. GRIND clearance angles and the tool is ready for use.

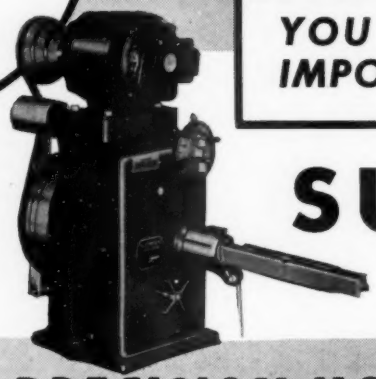
FIRTH-STERLING STEEL COMPANY

OFFICE AND WORKS:
McKEESPORT, PA.
BRANCH WAREHOUSES:
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DAYTON
CLEVELAND DETROIT

IF YOU HAVE A JOB REQUIRING



1. **The Finishing of Internal Cylindrical Surfaces from .185" to 2.400"**
2. **Precision Limits within .0001"**
3. **Super-smooth Finish**



YOU CAN SOLVE FIVE IMPORTANT PROBLEMS with the

SUNNEN 4-SPEED PRECISION HONING MACHINE

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Molded Composition (Bakelite) Pulleys. Molded composition is a difficult material to machine but it can be easily honed to a smooth finish.

Stone Lettering Air Hammer "Sunnen honing does in five minutes what it took 20 minutes to do by lapping."

"Produced an extremely accurate and glass-like finish."

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

"A perfectly straight round hole with a mirror finish."

Throughout the metal working industries, especially on defense jobs ranging from airplanes to steam turbines, hundreds of manufacturers have found the answer to increased production with greater accuracy and lower costs in this practical, inexpensive machine—because it:

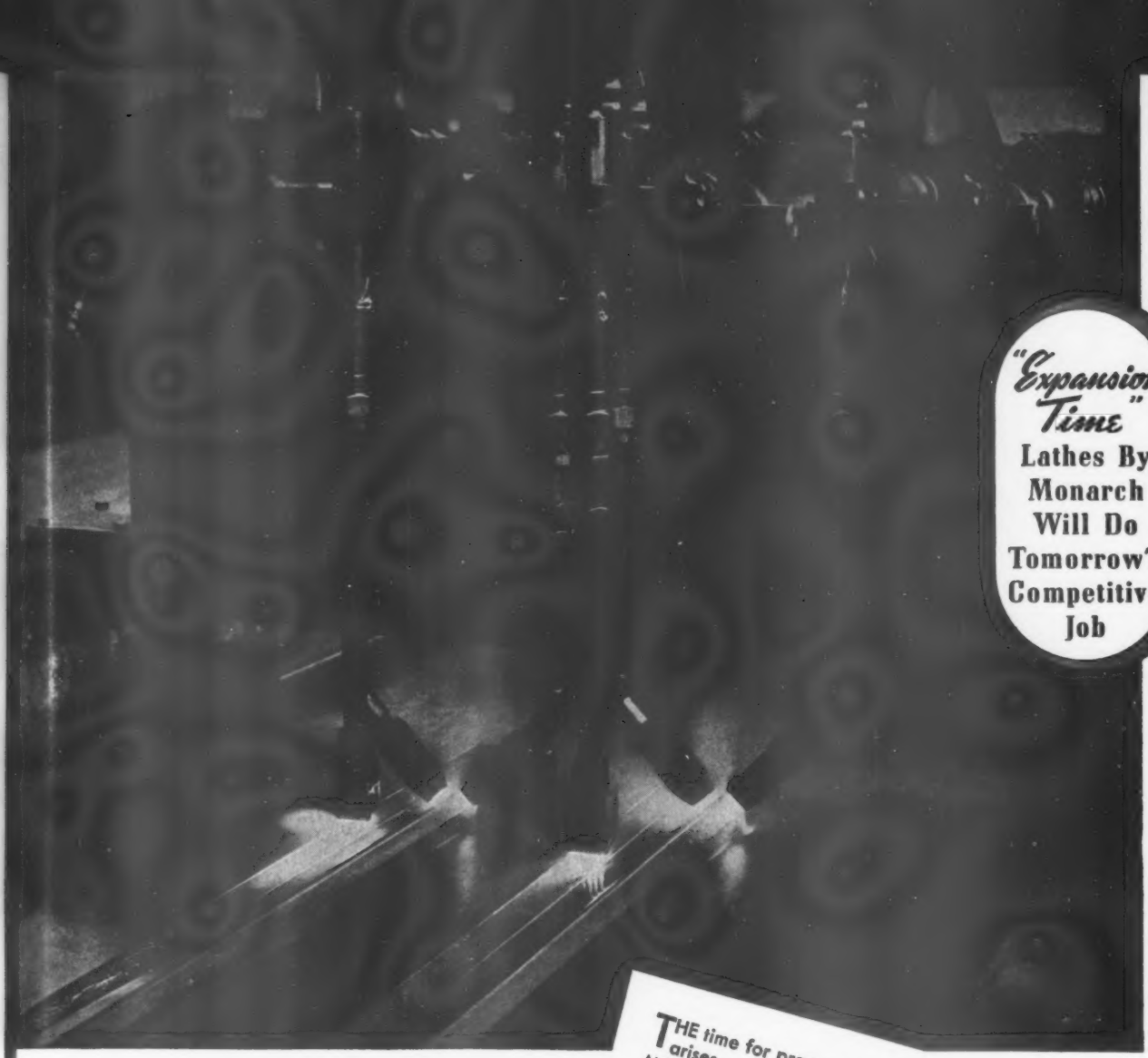
1. Corrects errors of out-of-roundness and taper produced by previous operations
2. Produces super-smooth surface finishes
3. Finishes holes to close tolerances both as to size and straightness
4. Maintains alignment established by previous operation
5. Provides simple, low cost production method of duplicating sizes accurately

and here's the best news of all! You don't need a skilled machinist to operate the Sunnen Precision Honing Machine! Any intelligent workman with a few hours' practice can produce super-smooth finishes and hold accuracy within .0001".

Can be set up and work located in less than one minute!

If you have an internal sizing or finishing operation within the range of the Sunnen Precision Honing Machine it will pay you to write at once for new 8-page bulletin — or, if you prefer, a sales engineer will be glad to call and demonstrate in your plant on your job just what this machine can do for you.

SUNNEN PRODUCTS CO. 7932 Manchester Ave., St. Louis, Mo.
Canadian Factory, Chatham, Ontario



"Expansion Time"
Lathes By Monarch Will Do Tomorrow's Competitive Job

WHY RESEARCH
AT A TIME LIKE THIS?

THE time for preparedness is BEFORE the emergency arises . . . not AFTER. That's why, for many years, MONARCH has maintained a policy of constant, unrelenting research. From the crucible of MONARCH research have come many of the greatest improvements in modern lathe manufacture . . . notably, the exclusive "Flame Hardening" process.

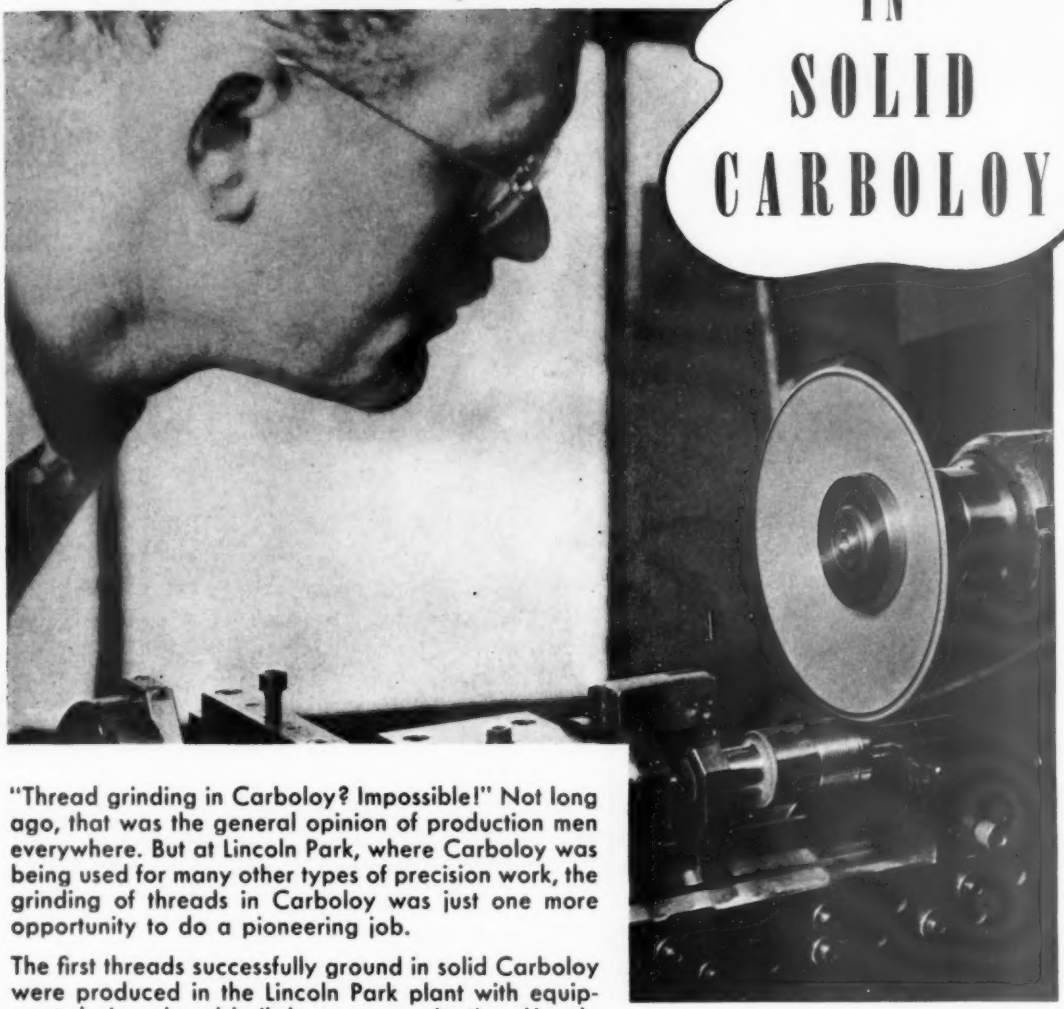
This development hardens the bed way surfaces of lathes after planing, by subjecting them to intense heat from oxygen-acetylene burner tips in a special "Flame Hardening" water tank. The depth of the hardened portion is a minimum of ⅛" and can be made ¼" or more. The grain structure of the entire hardened portion is greatly refined and condensed, while the dense, close-grained metal directly under the hardened portions, gives a rigid support. The "Flame-Hardening" process insures against bed wear, scoring, inaccuracy and shortened life . . . helps industry advance a step farther toward its ultimate goal of producing "More Goods For More People, At Lower Cost." The Monarch Machine Tool Company, Sidney, Ohio.

MONARCH LATHES

Tool-up with Monarch!

No. 5 IN THE SERIES OF LINCOLN PARK *Firsts*

Grinding Threads IN SOLID CARBOLOY



"Thread grinding in Carboloy? Impossible!" Not long ago, that was the general opinion of production men everywhere. But at Lincoln Park, where Carboloy was being used for many other types of precision work, the grinding of threads in Carboloy was just one more opportunity to do a pioneering job.

The first threads successfully ground in solid Carboloy were produced in the Lincoln Park plant with equipment designed and built by our organization. Lincoln Park's Carboloy thread gages are now in regular service in aircraft and other precision industries. Today, with our facilities, external American National form threads which can be ground in steel can be ground in Carboloy, and to the highest degree of accuracy.

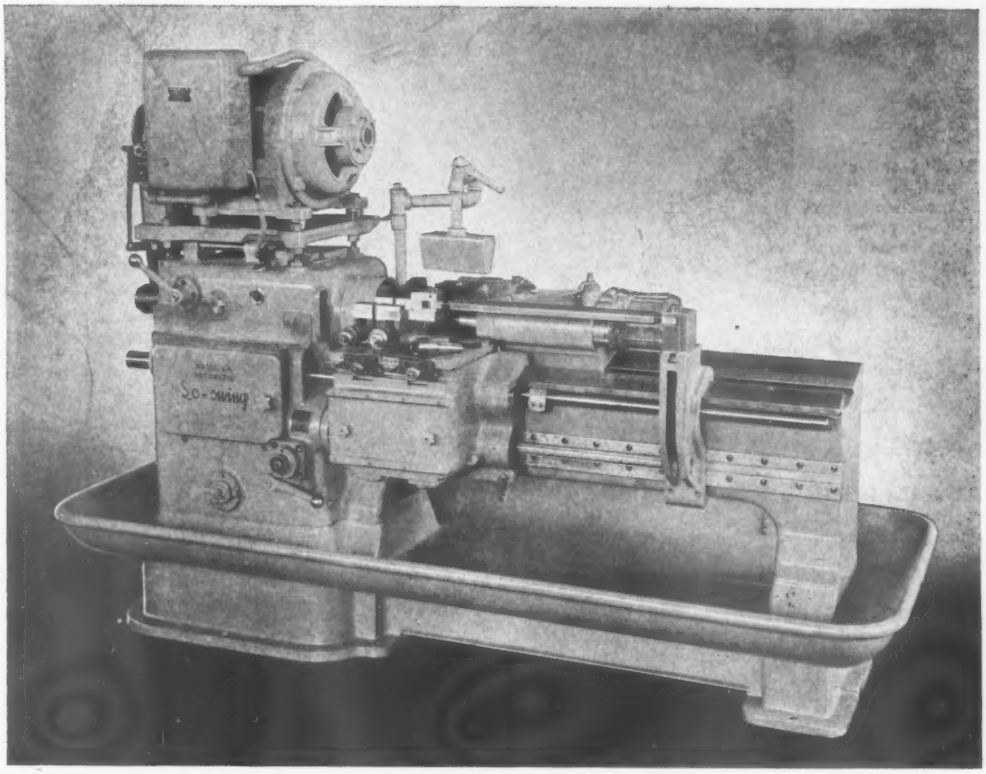
Not only has Lincoln Park pioneered advancements in the manufacture of thread gages, but many other important developments have been and are being made in the production of all types of gages and non-cutting precision tools. This program of new and constantly improving methods is now—and always will be—your guarantee of Lincoln Park dependability.

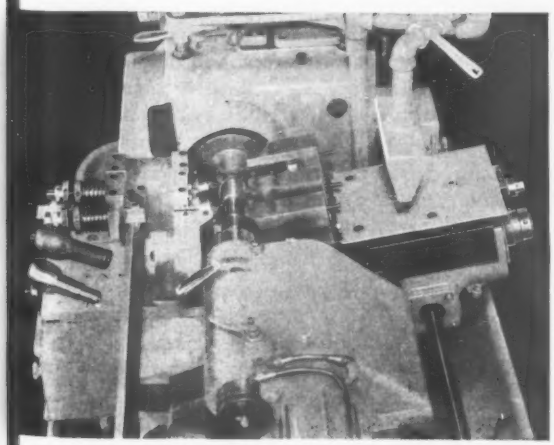
LINCOLN PARK TOOL and GAGE CO.
LINCOLN PARK, MICHIGAN

MACHINE OF THE MONTH

EPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

MODEL LR Lo-swing LATHE COMPLETELY TURNS TORQUE ROD END PINS IN ONE OPERATION





Close-up showing tooling and work in position. A rough forging and a finished piece may be seen on the carriage.

Problem: To completely turn, face, chamfer and square torque rod end pin forgings in one operation on a production basis.

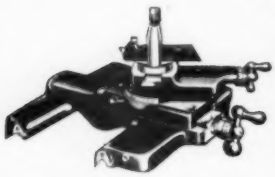
Solution: A Model LR Automatic Lo-Swing was selected for this job because it provided adequate speed, power and capacity.

The work comes to this machine in the form of rough forgings with a square hole in the ball end and with center holes drilled in a previous operation on a Seneca Falls Star Drilling and Centering Machine. Work is driven by means of a square driver, so designed as to clear the facing tool at that end. The opposite end of the piece has a protected center. In this way both ends can be completely faced.

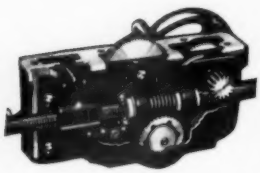
The front carriage carries one plain and two template-controlled tool blocks. The two facing tools and one squaring tool are mounted on the back attachment. All tools are cemented carbide. Production is about 70 pieces per hour at 85% efficiency, and the work leaves this machine ready for grinding.

Precision is Assured IN A SOUTH BEND LATH

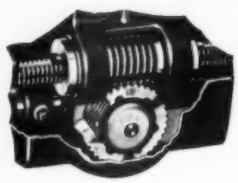
SUPERFINISHED SPINDLE is made of alloy steel with bearing surfaces carburized, hardened, ground and superfinished.



IMPROVED SADDLE and compound rest with adjustable tapered gibs. Cross slide bridge is wide and deep, providing rigid support for the tool rest.



DOUBLE WALL APRON is rigid box type construction with all steel gears running in oil bath.



MULTIPLE DISC CLUTCH. Cutaway view shows alternate keyed steel disc construction.

UNDERNEATH MOTOR DRIVE. Belt drive to spindle is smooth and powerful and provides a wide range of spindle speeds.

PRECISION is assured in South Bend Lathes by combining fine workmanship with sound machine design. Expert mechanics, skilled by years of experience, fit and test each unit with a degree of exactness known only to the machine tool builder.

South Bend Lathes are used in the tool and gauge departments of nationally known manufacturers for the most exacting classes of precision work. They are also used for production operations on interchangeable parts requiring a high degree of accuracy. Conveniently located controls assure an ease of operation which reduces operator fatigue, resulting in a uniformly efficient rate of production over a long period of time.

South Bend Lathes are manufactured in over 65 sizes and types. Popular sizes are available for prompt delivery from dealer display stocks in important cities throughout the world. Made in 9", 10", 13", 14½", and 16" swing, in 3' to 12' bed lengths, in Countershaft and Motor Drives.

ON DISPLAY IN ALL PRINCIPAL CITIES

Baltimore, Md.—Carey Machinery & Supply
Boston, Mass. — South Bend Lathe Works*
Bridgeport, Connecticut — A. C. Bisgood
Buffalo, New York—R. C. Neal Company, Inc.
Cleveland, Ohio — Reynolds Machinery Co.
Dayton, Ohio—C. H. Gosiger Machinery Co.
Detroit, Mich.—Lee Machinery Company
Houston, Texas—Wessendorff, Nelms & Co.
Los Angeles, Cal.—Eccles & Davies Mach. Co.
Milwaukee, Wis.—W. A. Voell Machinery Co.
Newark, N. J.—J. R. Edwards Machinery Co.
New York, N. Y.—A. C. Colby Machinery Co.
Philadelphia, Pa. — W. B. Rapp, Machinery
Pittsburgh, Pa. — Tranter Manufacturing Co.
Portland, Ore.—Portland Machinery Company
Providence, R. I.—Geo. T. Reynolds & Son
Rochester, New York—Ogden R. Adams
St. Paul, Minn. — Robinson, Cary & Sands
San Francisco, Cal.—Moore Machinery Co.
York, Pa. — York Machinery & Supply Co.

*Boston Sales Office: 67 Broadway, Kendall Sq., Cambridge, Mass., Phone Trowbridge 6369.

SOUTH BEND LATHE WORKS

LATHE BUILDERS SINCE 1906

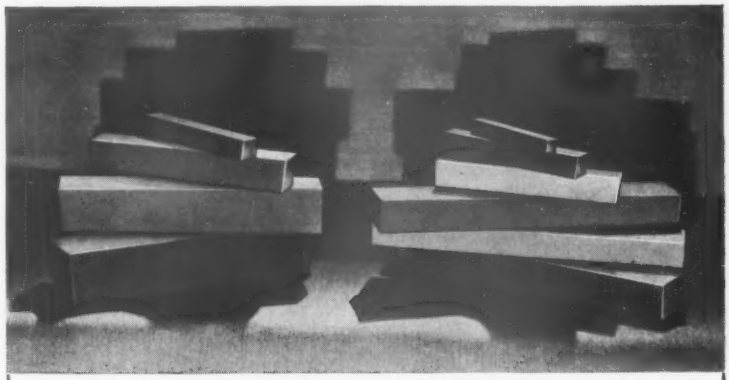
923 E. Madison St., South Bend, Ind., U.S.A.

TRADE MARK SOUTH BEND TWINS

For Quick Delivery and Smaller Inventory— Order Standard HAYNES STELLITE TOOL BITS

STANDARD Haynes Stellite tool bits are available for immediate delivery in a complete assortment of sizes—in both square and flat shapes. These solid bits can be readily converted to the various special cutting profiles required for different machining operations, so that any one size will serve for a wide variety of jobs. It is thus possible to hold your tool inventory at a minimum.

Also available for immediate delivery are Haynes Stellite standard welded tip tools and milling cutter blades. *Special* tools — including form tools, blades for milling, boring, and reaming, spot facers, welded tip tools, grooving and cutting-off tools, counterbores, reamers, and brazed-in blade milling cutters — are supplied to users' specifications. Write today for full information.



STOCKED FOR IMMEDIATE DELIVERY

Standard Star J-Metal and 2400-Metal tool bits are furnished in square and rectangular shapes ranging from 2 to 6 in. in length. These tools are finish ground with tolerances of plus 0.000 in., minus 0.005 in. on cross-sectional dimensions, and plus or minus ⅛ in. on length. Sizes are listed below.

Standard Square Sizes, inches		*Standard Rectangular Sizes, inches*	
3/16 sq. x 3	1/2 sq. x 4 1/2	3/16 x 3/4 x 4	3/8 x 1 x 4
1/4 sq. x 2 1/8	1/2 sq. x 5	1/4 x 5/16 x 1 1/2	3/8 x 1 x 4 1/2
1/4 sq. x 3	1/2 sq. x 6	1/4 x 3/8 x 2	1/2 x 5/8 x 3
5/16 sq. x 2 1/4	5/8 sq. x 3	1/4 x 3/8 x 6	1/2 x 5/8 x 4
5/16 sq. x 2 1/2	5/8 sq. x 3 1/2	1/4 x 1/2 x 4	1/2 x 5/8 x 5
5/16 sq. x 3	5/8 sq. x 4	1/4 x 1/2 x 6	1/2 x 3/4 x 3
3/8 sq. x 2	5/8 sq. x 4 1/2	1/4 x 3/4 x 6	1/2 x 3/4 x 4
3/8 sq. x 2 1/2	5/8 sq. x 5	5/16 x 1/2 x 3	1/2 x 3/4 x 5
3/8 sq. x 2 3/4	5/8 sq. x 6	5/16 x 1/2 x 6	1/2 x 3/4 x 6
3/8 sq. x 3	3/4 sq. x 3	5/16 x 5/8 x 4	1/2 x 1 x 3
3/8 sq. x 3 1/2	3/4 sq. x 3 1/2	5/16 x 3/4 x 6	1/2 x 1 x 4
3/8 sq. x 4	3/4 sq. x 4	5/16 x 1 x 4	1/2 x 1 x 5
3/8 sq. x 6	3/4 sq. x 4 1/2	5/16 x 1 x 6	1/2 x 1 x 6
7/16 sq. x 3	3/4 sq. x 5	3/8 x 1/2 x 2	5/8 x 3/4 x 3
7/16 sq. x 3 1/2	3/4 sq. x 5 1/2	3/8 x 1/2 x 3	5/8 x 3/4 x 4 1/2
1/2 sq. x 2 1/2	3/4 sq. x 6	3/8 x 1/2 x 4	5/8 x 3/4 x 5
1/2 sq. x 3	7/8 sq. x 5	3/8 x 1/2 x 6	5/8 x 3/4 x 6
1/2 sq. x 3 1/2	7/8 sq. x 6	3/8 x 5/8 x 3	5/8 x 1 x 4 1/2
1/2 sq. x 4	1 sq. x 5	3/8 x 5/8 x 4	5/8 x 1 x 6
		3/8 x 3/4 x 3	5/8 x 1 1/4 x 4
		3/8 x 3/4 x 6	5/8 x 1 1/4 x 6
		3/8 x 3/4 x 4	3/4 x 1 x 5
		3/8 x 1 x 3	3/4 x 1 x 6

The cutting ends of square bits are ground with a 7-deg. front clearance, and the gate ends of square and rectangular bits are notched so they will not be used for the cutting edge.

HAYNES STELLITE TRADE MARK

Red-hard, wear-resisting alloys of cobalt, chromium and tungsten

HAYNES STELLITE COMPANY

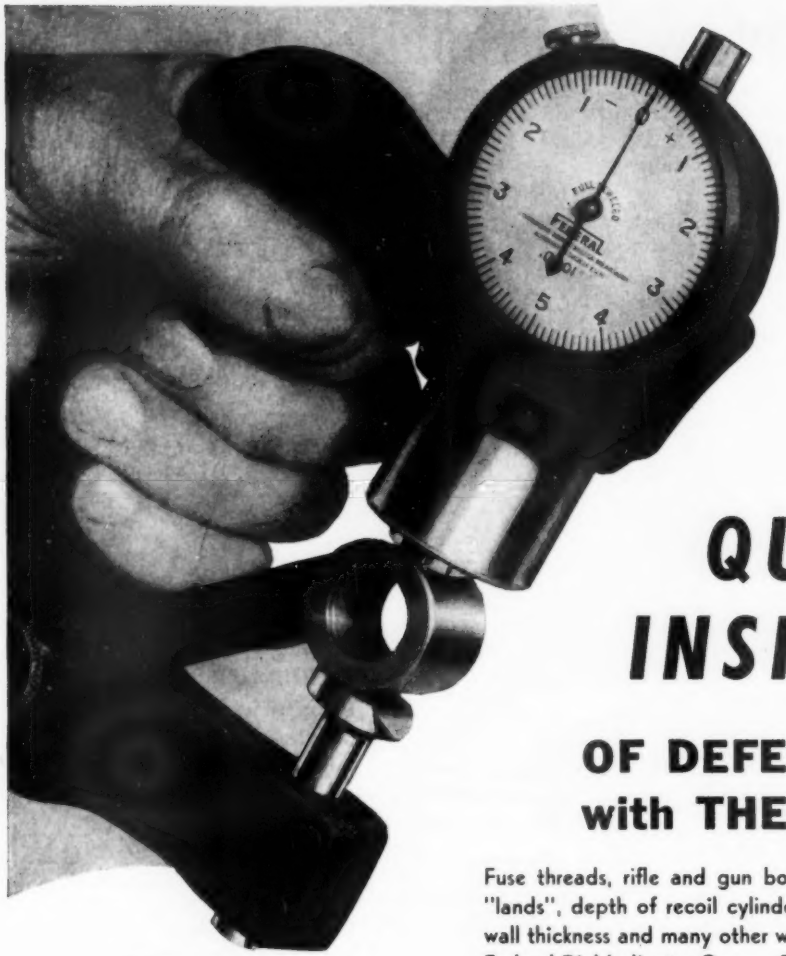
Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company



MODEL 264 P-101
SNAP GAGE

This modern Snap Gage is fast and positive. Adjustable for size, positive upper anvil pressure, insures uniform gaging.

QUICKER INSPECTION

OF DEFENSE MATERIAL with THESE DIAL GAGES

Fuse threads, rifle and gun bore diameters on both "grooves" and "lands", depth of recoil cylinder slots, shell diameters, concentricity, wall thickness and many other war units can be inspected quicker with Federal Dial Indicator Gages. The following are a few that will speed up your inspection.

MODEL 45 B-60	**Pitch Diameter Gage**
MODEL 264 P-101	**Snap Gage**
MODEL 1330 P	**Snap Gage**
MODEL G3F P	**Gun Bore Gage**
MODEL 36 B-6	**Small Hole Gage**
MODEL 1201 P	**Long Hole Gage**
MODEL 49 P	**Caliper Gage**
MODEL 165 P	**Plug Gage**

Write us for details concerning any of these gages or send us drawings of work you wish to inspect.

FEDERAL PRODUCTS CORPORATION
1144 Eddy St. **Providence, R. I.**

FEDERAL

PRECISION MEASURING INSTRUMENTS

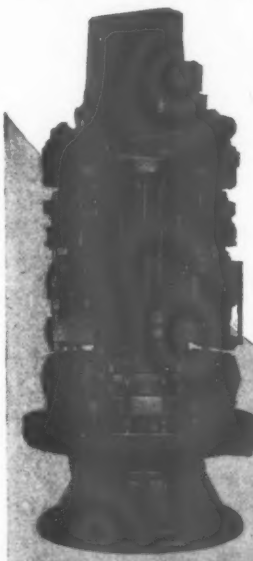
Chicago • Cleveland • Detroit • Hartford • Los Angeles • Muncie
New York • Philadelphia • Pittsburgh • Rochester • San Francisco • Seattle

IS YOUR PROBLEM DELIVERY OR PRODUCTION?

You Can Afford To Wait for Production Like This

Generally it takes longer to build a special machine than it does to build a standard tool. But with deliveries on *all* equipment equally unattractive, it may pay you to wait a little longer for a special machine . . . one fitted to *your* job alone. Any time lost in delivery will soon be made up in greater productivity. You'll get less spoilage through greater accuracy. Here are the results of our work with one manufacturer:

WHEEL CYLINDERS PRODUCED AT RATE OF SIX HUNDRED PER HOUR



MACHINE IN BRIEF

Eight station, Center Column machine, provided with 7 working and one loading station. Except for loading and unloading, machine is entirely automatic.

Fixture and tooling are special . . . designed for wheel cylinders alone. The rest of the machine is standard and can be retooled for similar or dissimilar parts.

Unskilled operators have no trouble in operating the Center Column machine.

These wheel cylinders, used in hydraulic automobile brakes, are rough and finish hollow-milled, chamfered, drilled, and tapped *simultaneously*. Production is over six hundred cylinders per hour, and *spoilage is less than one-half of one percent.*

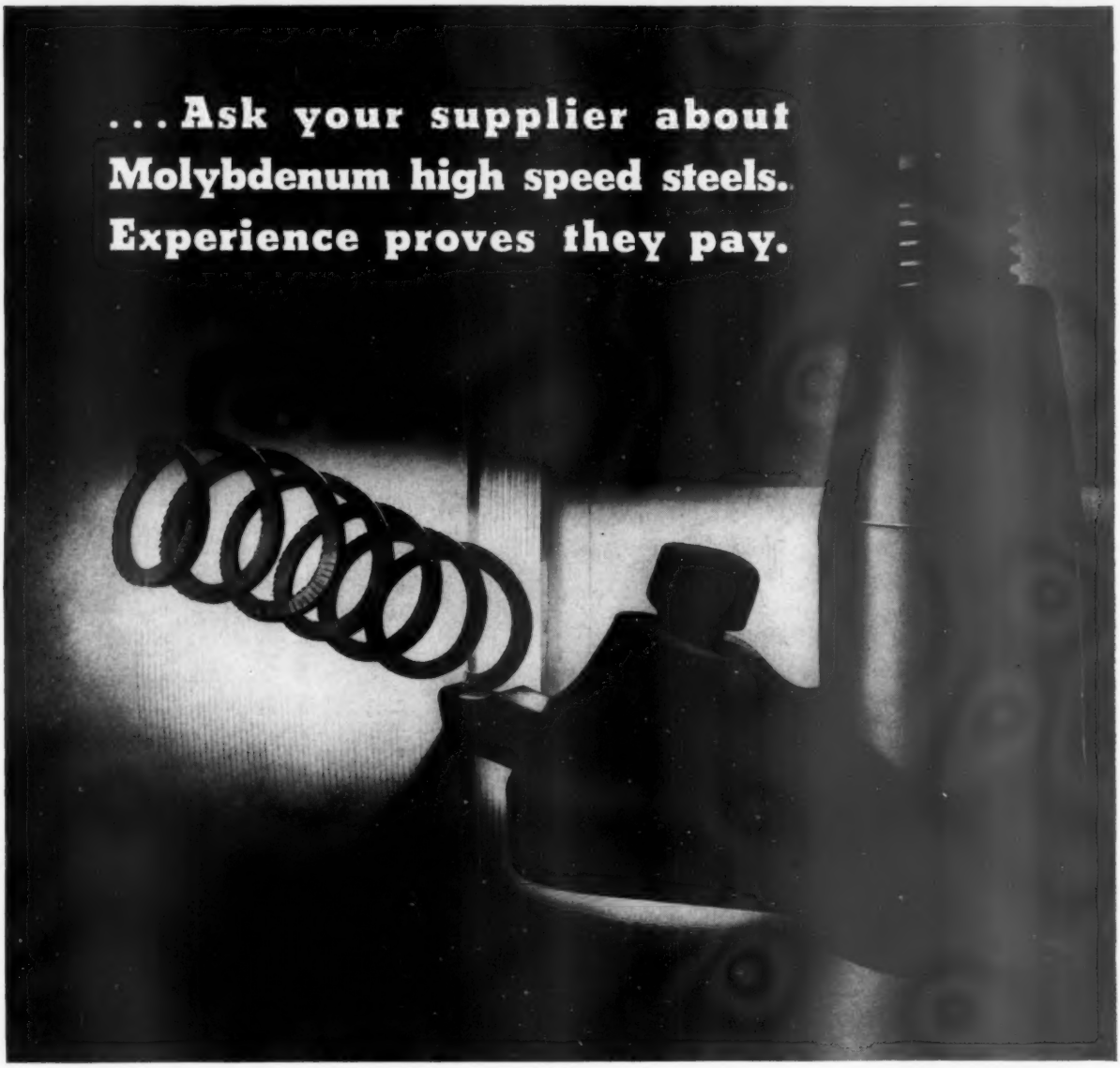
STANDARD ELEMENTS MAKE ECONOMICAL SPECIAL MACHINES

You'll find our engineering service backed by many standard hydraulic and machine units. This makes it possible for you to avail yourself of the advantages of special machines with a reasonable investment. How it has helped other manufacturers is shown in our booklet "Since 1872 . . . ". May we send your copy?

W. F. AND JOHN BARNES COMPANY

ROCKFORD . . . . ILLINOIS

DESIGNERS AND BUILDERS OF DRILLING — BORING — TAPPING — MILLING AND HONING MACHINES TO SUIT YOUR PARTS — YOUR PRODUCTION



You know what you want from your cutting tools. Here's what users are getting from molybdenum high speed steels, in comparison with the tungsten types.

Equivalent cutting properties Greater toughness Lower cost

These are facts — with nine years' experience in thousands of shops to back them up. Check cost and performance records with any user you like. See your supplier for the proper analysis and heat treatment for your requirements.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • CALCIUM MOLYBDATE

Clima[illegible]-ly-[illegible]enum [illegible]mpany
500 Fi[illegible] Ave[illegible] • New York City

MOLY

HELPING SOLVE INDUSTRY'S PRODUCTION PROBLEMS

RIFLING *now practical* *by* BROACHING!

"Illinois Tool" engineers develop complete tooling and equipment for broaching machine gun and rifle barrels

Years of intensive research by "Illinois Tool" engineers have recently resulted in the first successful adaptation of the broaching method to the rifling of machine gun and rifle barrels.

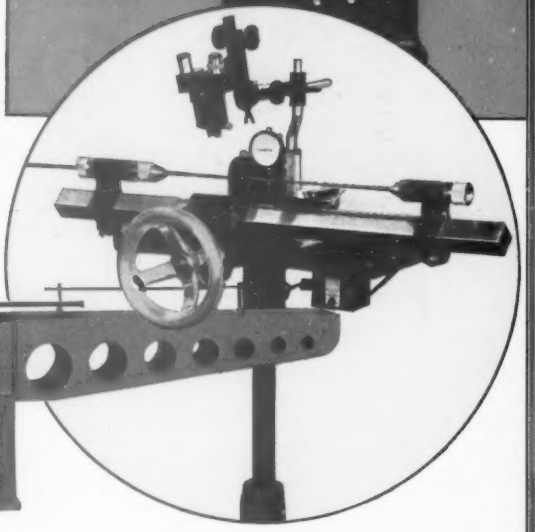
This important defense contribution brings the increased production, speed and accuracy of the broaching method to a field producing vital parts for our armament program.

All the elements for this new broaching system were designed and manufactured under the supervision of "Illinois Tool" engineers, including:

1. Broaches
2. Broaching machines
3. Broach sharpening machines
4. Broach inspection fixtures

The successful rifling of gun barrels by the broaching method is an outstanding example of "ILLINOIS" engineering research teamed with practical production experience, providing the solution to a difficult production problem.

"ILLINOIS" broach sharpening machine.



Close-up view of special "ILLINOIS" inspection fixture for rifling broaches.

View of special "ILLINOIS" broaching machine for 50 caliber machine gun barrels.

ILLINITE

HIGH SPEED PRODUCTION TOOLS

Milling Cutters • Ground Hobs • Broaches
Shaper Cutters • Ground Form Tools
Special Tools • Die Filing Machines
Gear Measuring Machines

ILLINOIS TOOL WORKS

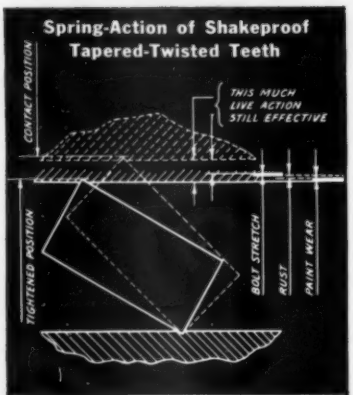
MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

2501 NORTH KEELER AVENUE, CHICAGO, ILLINOIS • IN CANADA: CANADA ILLINOIS TOOLS, LTD., TORONTO, ONTARIO

NEW TEST KIT!

SHAKEPROOF

LOCK WASHERS



TEST THIS POWERFUL LOCKING METHOD ON YOUR OWN PRODUCT

Right on your own product—that's the way to test Shakeproof Lock Washers! And, the handy sample kit, illustrated above, will help you do it. In this neat container a broad assortment of standard types and sizes is furnished for your convenience. Mail the coupon below for your kit today and see how thoroughly this positive locking method protects against vibration.

SHAKEPROOF LOCK WASHER CO.
Distributor of Shakeproof Products
Manufactured by ILLINOIS TOOL WORKS
2501 North Keeler Avenue, Chicago, Illinois
Plants at Chicago and Elgin, Illinois
Canadian Plant: Canada Illinois Tools, Ltd., Toronto, Ontario
Foreign Licensees: Barber and Colman, Ltd., Brooklands, Manchester, England; Carr Fastener Co. of Australia, Ltd., Royal Park, South Australia.

Mail this today!

SHAKEPROOF LOCK WASHER CO.
2501 N. Keeler Ave., Chicago, Ill.

Gentlemen:

Kindly send us a free sample kit of your Shakeproof Lock Washers.

Name _____

Address _____

City _____ *State* _____

Signed by _____ *Title* _____

FREE

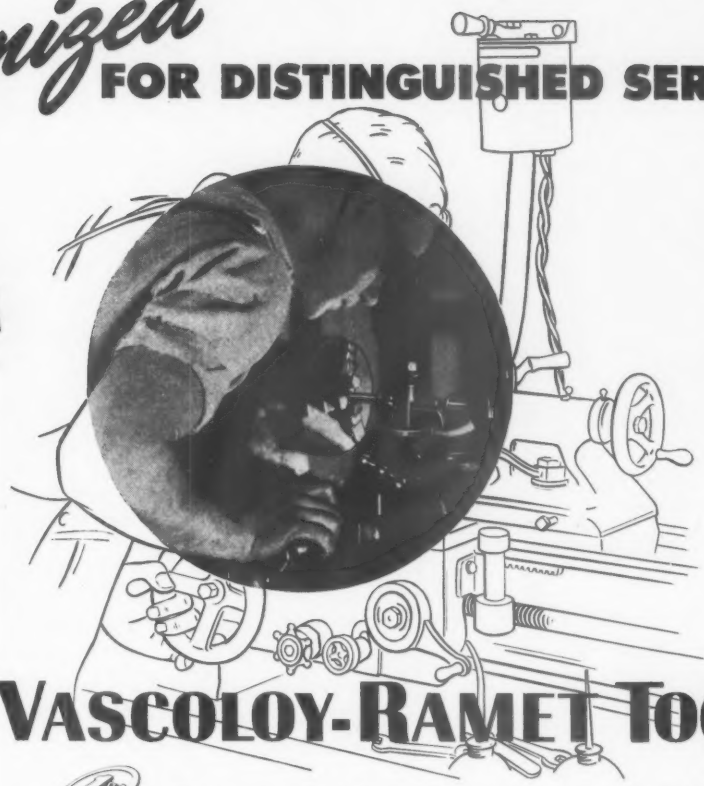
"Fastening Headquarters"

SHAKEPROOF

SEMS Fastener Units . . . Lock Washers . . . Locking and Plain Terminals

Thread-Cutting Screws...Locking Screws ...Spring Washers...Special Stampings

Recognized FOR DISTINGUISHED SERVICE



Vascoloy RAMET

Tantalum-Tungsten Carbide Tools

• •

AS NEAR AS YOUR TELEPHONE

• • •

Call the nearest of these FACTORY-OWNED BRANCHES:

BUFFALO	Washington 7716
CHICAGO AREA	Rogers Park 9500
CINCINNATI	Main 5387
CLEVELAND	Cherry 0278
DETROIT AREA	Madison 6300
HARTFORD	32-5197
MILWAUKEE	Broadway 3111
NEW JERSEY AREA	Journal Square 2-2231
NEW YORK AREA	Worth 2-3923
PHILADELPHIA	Rittenhouse 8360
PITTSBURGH	Atlantic 9699
PROVIDENCE	Dexter 1271
ST. LOUIS	Newstead 3110
SYRACUSE	3-0334

Where you cannot use cemented carbide, use

TANTUNG "G"

the new Miracle Cutting Metal (not a steel, not a cemented carbide) . . . most efficient at speeds about double those of high speed steel. Available in two styles and 65 standard sizes. Ask for information.

VASCOLOY-RAMET TOOLS

The medal for distinguished service in speeding production in this emergency goes to Tantalum Carbide. Wherever steel is being machined it is being done faster with VASCOLOY-RAMET Tantalum-Tungsten Carbide Tools.

With VASCOLOY-RAMET Tools you can be sure of more pieces per tool grind, per hour, per machine—all of which adds up to greater production with the same number of machines and men.

For cutting steel it is not just "carbide," but Tantalum-Tungsten Carbide . . . *and the foremost of them all* is VASCOLOY-RAMET.

VASCOLOY-RAMET CORPORATION
NORTH CHICAGO, ILLINOIS
An Affiliate of
FANSTEEL METALLURGICAL CORPORATION
and
VANADIUM-ALLOYS STEEL COMPANY
AUTHORIZED AGENTS IN PRINCIPAL CITIES
In Canada: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

THE SUPERIOR TANTALUM-TUNGSTEN CARBIDE TOOLS

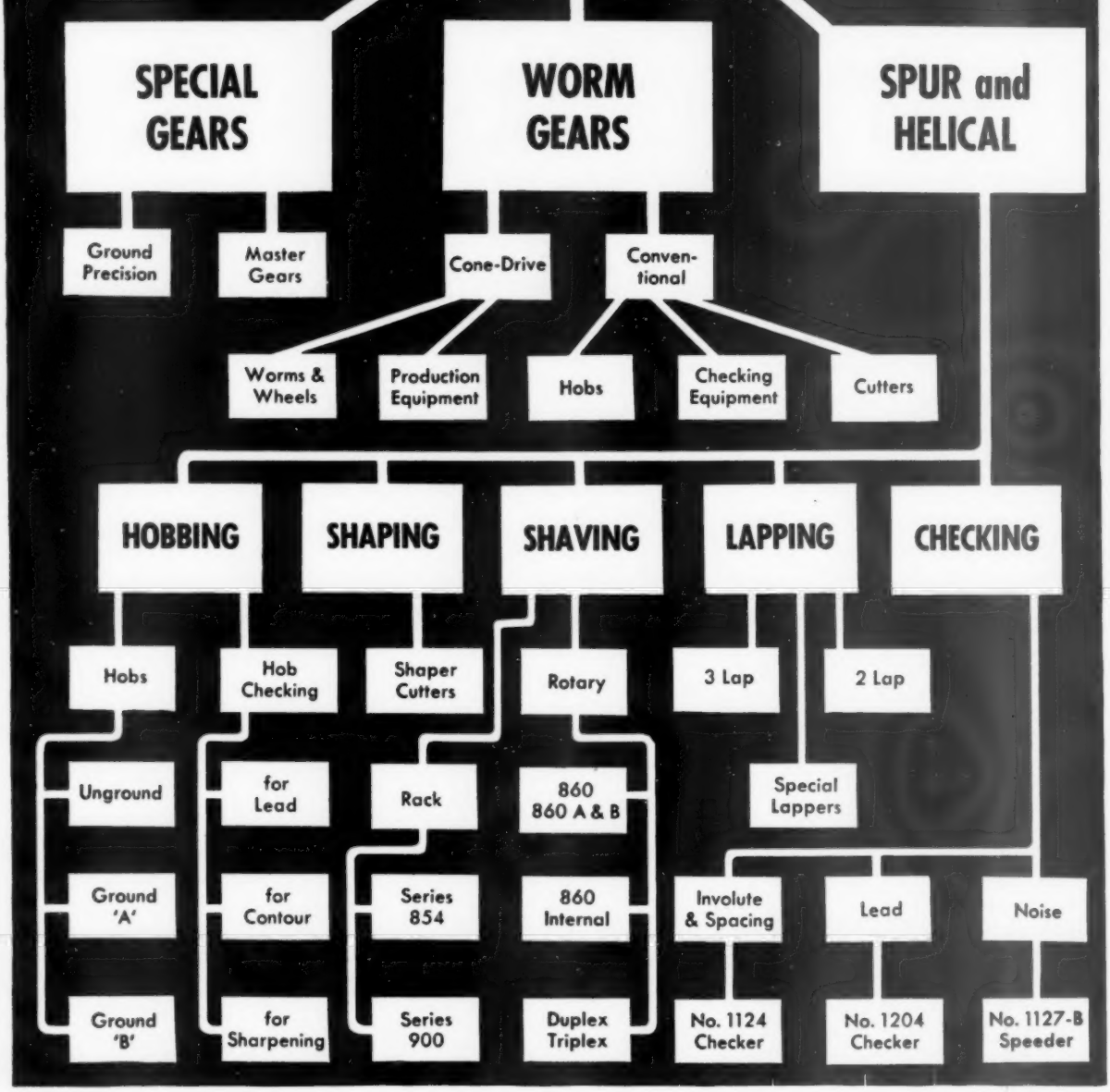
GEAR PRODUCTION HEADQUARTERS

The Michigan line of products, today, comprises what is probably the most comprehensive line of gear production aids in industry — developed through the years in answer to specific needs of gear producers and users.

With a continuously expanding line of products, Michigan engineering services have similarly grown to help industry solve its gear-production problems.

Those services are yours for the asking—at "Gear Production Headquarters."

MICHIGAN TOOL Company
7171 E. McNichols Road, Detroit



FOR *All-Out* PRODUCTION

Call on
KENT-OWENS
for Milling Machines

● As the wheels of industry turn faster and faster in defense production . . . the role of Kent-Owens Milling Machines becomes increasingly important. Their all-round practical features appeal to shop men in all lines of industry who want *rugged, simple, efficient* milling machines. Write for bulletins. Kent-Owens Machine Company, Toledo, O.

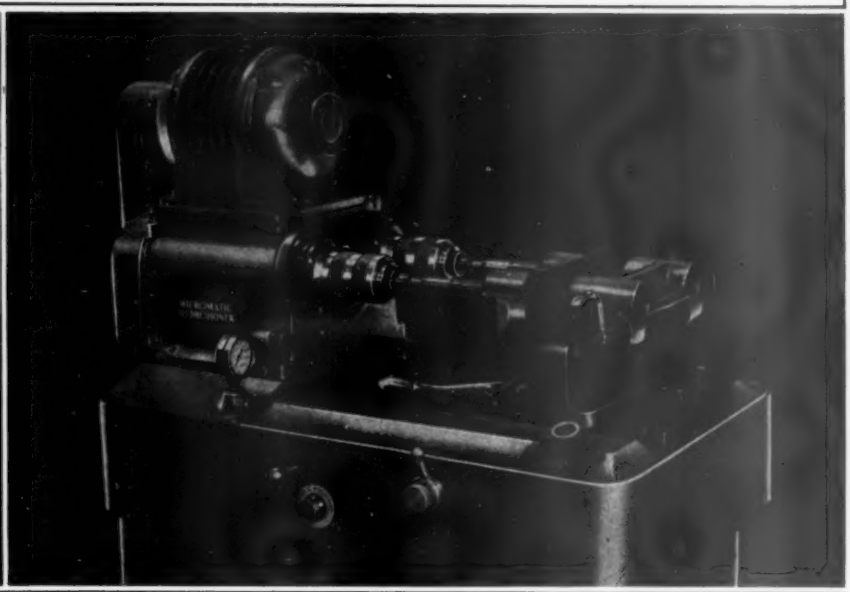
★ ★ ★

MICROMATIC HYDROHONER
with
AUTOMATIC MICROSIZE

Generates

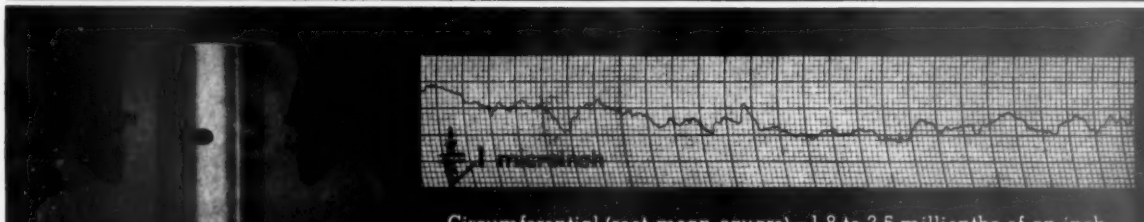
Uniform Size within .0002" to .0005"
Bore Accuracy within .0001" to .0002"
Removes Sufficient Stock for Above Results

Automatic
Second Speed
Gear



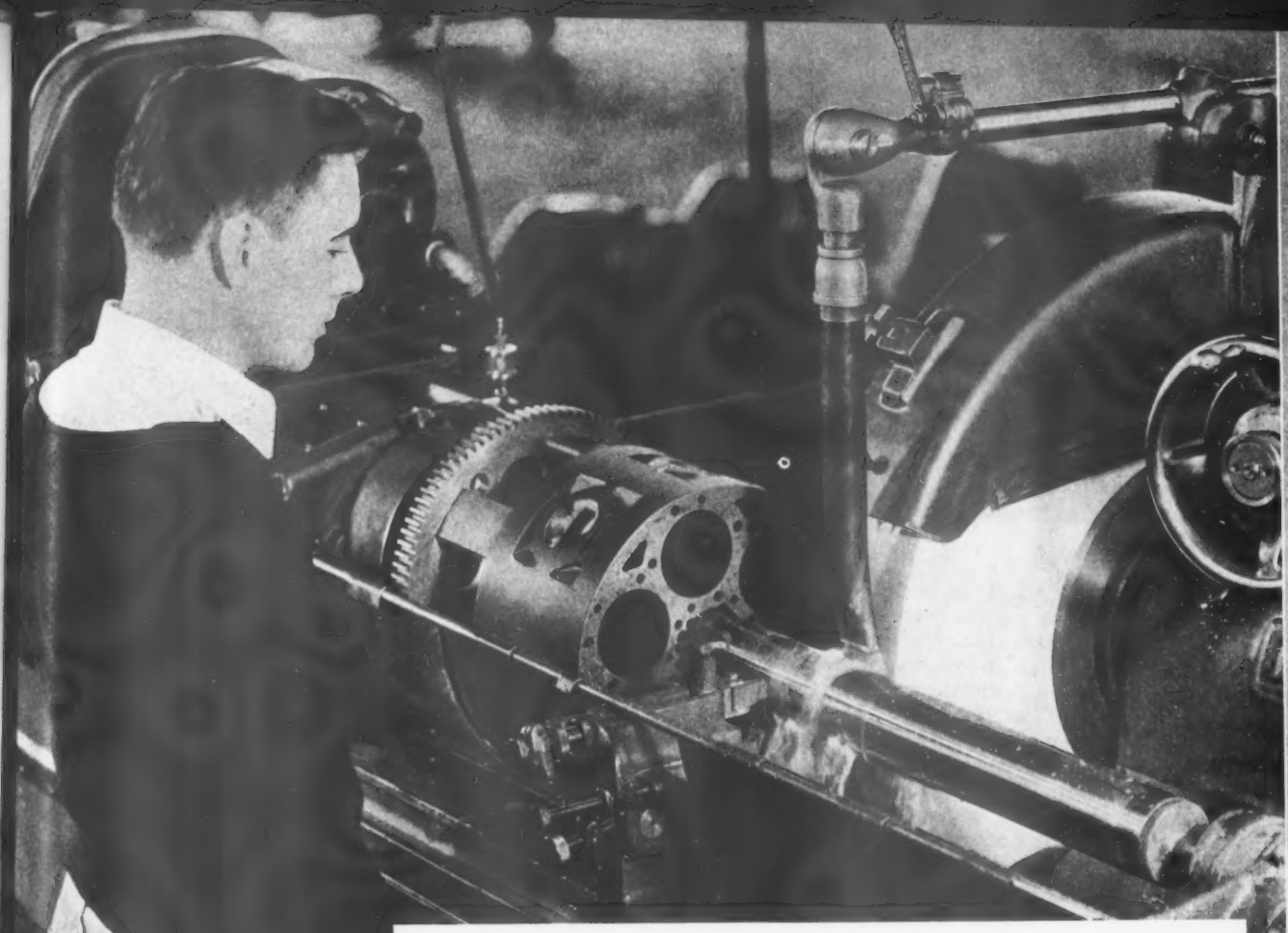
In forged steel second speed gear bores 1.062" I.D. x 1.886" long, and Rockwell C 49-54 hardness; total error up to .001" is corrected by removing .001" to .0015" stock following grinding, generating uniform size within .0005", geometric accuracy within .0001" to .0002" and surface smoothness accuracy within 1.8 to 2.5 microinches root-mean-square—all at the rate of 240 bores per hour on this two spindle machine.

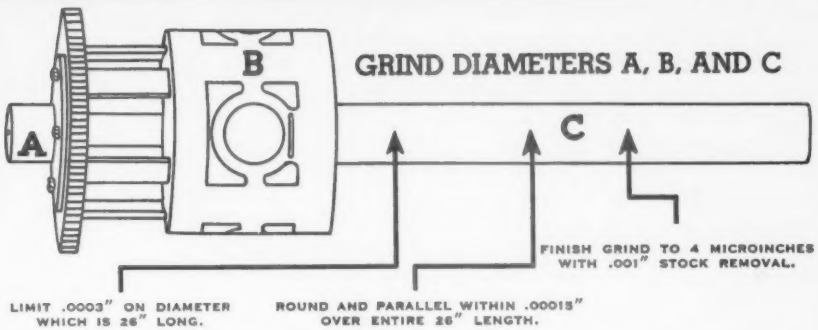
Generates any desired type and degree of surface smoothness



Circumferential (root-mean-square)—1.8 to 2.5 millionths of an inch

MICROMATIC HONE CORPORATION
1345 E. Milwaukee Ave. Detroit, Michigan




B
A
C
GRIND DIAMETERS A, B, AND C
FINISH GRIND TO 4 MICROINCHES WITH .001" STOCK REMOVAL.
LIMIT .0003" ON DIAMETER WHICH IS 26" LONG.
ROUND AND PARALLEL WITHIN .00015" OVER ENTIRE 26" LENGTH.

SEVERE REQUIREMENTS
• • MET BY LANDIS • •

Recently a Landis 14" x 48" Type C Plain Hydraulic grinder was installed in the plant of a well known machine tool manufacturer in Connecticut. There it is being used to rough and finish grind carrier assemblies and is satisfactorily meeting very severe performance requirements. ○ ○ ○ Three diameters are ground on the carriers, of which one, the stem, is first rough ground removing .030" stock. The two other diameters are then ground to a good commercial finish after which the grinding wheel is changed for the finish grind on the stem. About .001" stock is removed within a limit of .0003"; however, the stem must be round and parallel within .00015" over its entire 26" length. A surface finish of 4 microinches is required. ○ ○ ○ Such satisfactory results on a job so demanding invite your investigation. Why not give Landis a chance to meet YOUR requirements?

363

LANDIS TOOL CO.

WAYNESBORO, PENNSYLVANIA.

SHELL MARKING
With Less Power and a Lot More Production

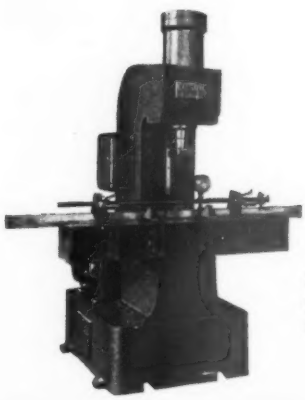
20-ton automatic press with indexing table for marking shell cases. Adapted to many other operations.

A typical example of the ability of Hannifin engineers to utilize hydraulic power and hydraulic controls to make production operations simpler, faster, more accurate, is this 20-ton automatic shell marking press. The 20-ton capacity is ample, where other types of equipment of much larger capacity formerly were used. The operating cycle varies with changes in length of stroke (which is adjustable) up to a maximum rate of 15 cycles per minute.

Besides speed and moderate power, this press provides accurate, uniform marking, simple set-up, and greatly simplified handling. The operator has only to start the press, and load and unload the fixture. Action of the indexing table is synchronized with the ram, which operates continuously. Steady production is maintained, with minimum fatigue, and with the operator's skill devoted to the work instead of to repeated control operations.

Pressure controlled reversal of the ram on the working stroke provides uniform maximum pressure, for uniform marking. Precise adjustment of die and mandrels is unnecessary. Both ram stroke and maximum pressure are adjustable.

This indexing press is but one of many Hannifin Hydraulic Presses designed for modern production requirements. Find out what this type of equipment could do for you; write for special bulletins on presses, or consult Hannifin engineers for specific recommendations.



20-ton straightening press with finger-tip sensitive pressure control.

HANNIFIN MANUFACTURING COMPANY
621-631 South Kolmar Avenue • Chicago
Detroit Representative: R. A. BEAN, Hayward Building
4829 Woodward Avenue · Telephone Columbia 4949

HANNIFIN Hydraulic Presses

THE TOOL ENGINEER

TRADE MARK REGISTERED
IN U. S. PAT. OFF.

AUGUST, 1941

Volume X, No. 8

The Party is Over

AN INTERESTING fact about the Curtiss plant in Buffalo, whose production methods are so completely described in this issue, lies in its handling of machine tools. When construction of the new plant was started last fall the operations were already being planned and the machine tools ordered.

Some of these tools were delivered before the building was ready to receive them. Rather than let the tools lie idle and gather dust during the waiting period, the Company rented an old warehouse, set up the tools temporarily, and put them into immediate operation.

Thru this efficient handling, they were able to save many hours of machine time and to enlarge the vital training program used to staff the new plant.

There is an example here well worthy of emulation, and broader in its implications than at first indicated. These are not times for any firm to let machines lie idle or materials go unused, and they are not times for men to let skills go unutilized. Already we have wasted too much time in bickering, in strikes, in red tape. We have, as a nation, been revelling in the prosperity brought on by war orders. We have reached a point where the demand for aluminum for civilian needs is fifteen times the supply for that purpose.

It is time to take the "Business as Usual" sign down; the party is over. The more readily we recognize this the more readily we will be able to adjust ourselves to the realities we must face.

One of these realities is that consumer industries which are big material users will face large curtailments. There is no necessity for a blind chopping off of forty per cent here and fifty per cent there—the cuts will come automatically as priorities control diverts materials into defense channels.

Another of these realities is that technically trained men are going to be needed in defense industries; needed so badly that both consumer industry and the army will have to give them up; needed so badly that they will have to forget hours of work and think only in terms of the job to be done.

Hitler wages total war, and you can't fight a total war with business continuing as usual.

It is time we all rented a "warehouse" and put forth every effort, at whatever cost, to help defend America.

CALL 'EM *RIGHT!*

If you find it difficult to describe a tap correctly, or if you are in any doubt about the exact meaning of certain terms, the definitions on this page may help you. Keep it for handy reference.

AXIS OF TAP: The longitudinal central line through the tap.

BODY: The threaded and fluted part of tap.

CHAMFER: The tapered outside diameter at the front end of the threaded section.

CUTTING FACE: The front part of the threaded section of the lands.

EXTERNAL (MALE) CENTER: Sometimes termed "male center." It is the cone shaped end of the tap. It is found only on small taps and is for manufacturing purposes. It is usually found only at the threaded end.

FLUTE: The groove providing for the cutting faces of the threads or teeth, for chip passage and for lubrication.

HEEL: The back part of the threaded section of the land.

HOOK: The curved undercut of the cutting face of the land.

INTERNAL (FEMALE) CENTER: Sometimes termed "female" center. It is the small drilled and countersunk hole at the ends of the tap, necessary for manufacturing purposes.

LAND: The threaded web between the flutes.

POINT DIAMETER: The outside diameter at the front end of the chamfered portion.

RADIAL: The straight cutting face of a land which, if continued, would pass through the center of the tap.

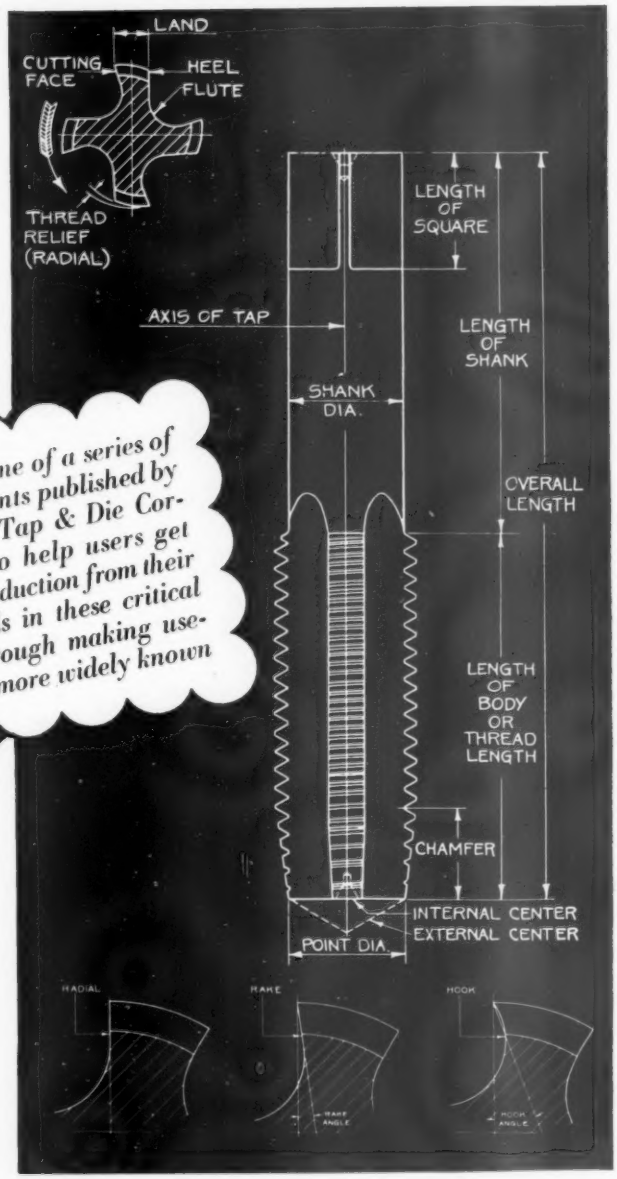
RAKE: The angle of the cutting face of the land in relation to a straight line from the point of the cutting face to the axis.

SHANK: The part behind threaded and fluted section of tap.

SQUARE: The squared end of the tap shank.

THREAD: The cutting tooth of the tap which produces the thread.

THREAD RELIEF (RADIAL): A clearance providing a gradual decline in the major, pitch and minor diameters of the lands, back of the cutting face. This style of relief is applied only to certain sizes and types of taps.



This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known

GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES · PIPE TOOLS

GREENFIELD TAP AND DIE CORPORATION
Greenfield, Massachusetts
Detroit Plant: 2102 West Fort St.
Warehouses in New York, Chicago and Los Angeles
In Canada:
Greenfield Tap and Die Corp. of Canada Ltd., Galt, Ont.

PURSUIT PLANE PRODUCTION
Curtiss Helldivers, an expanded plant with latest
methods of Mass Engineering to increase production
far above the former level of ten military planes a day.

Burdette S. Wright (left) vice president and general manager of the Airplane Division of the Curtiss-Wright Corporation looks over a scale model of the new Buffalo plant with P. N. Jansen, general factory manager.

Pursuit Plane Production

By A. C. SIEGEL
General Foreman, Airplane Division
Curtiss-Wright Corporation, Buffalo, New York
with J. A. ASHBURN

GLENN CURTISS was one of the earliest pioneers in modern aviation. On March 12, 1908, he made his first flight from the frozen surface of Lake Keuka in the "Red Wing." The original Curtiss Aeroplane Company was incorporated December 1, 1910, and started operations in Hammondsport, New York.

The first expansion took place in 1915 and another plant was added two years later. It was in these factories that the famous JN4-D or "Flying Jennies" were produced as well as Naval Patrol Flying Boats.

During the decade following the first World War, Curtiss concentrated on the pioneering of new designs. The Condor Transport was introduced, and such military planes as the Hawk, Falcon, and Helldiver. The St. Louis plant produced a civilian plane, the Robin, which was, many years later, to fly a man named Corrigan across the Atlantic.

In 1929 a major consolidation of the Curtiss Aeroplane and Motor Co. with the Wright Aeronautical Corp. was consummated resulting in the Curtiss-Wright Corporation. At this time the engine rights were transferred to the Wright Division at Paterson, N. J., and the Curtiss plants in Buffalo were devoted solely to the production of military aircraft.

As World War II got under way five new buildings were added. Late in 1940 ground was broken for three new plants at the municipal airports in Buffalo, St. Louis, and Columbus.

This new plant, at Buffalo, has an area of 1,200,000 square feet and is being equipped with six million dollars

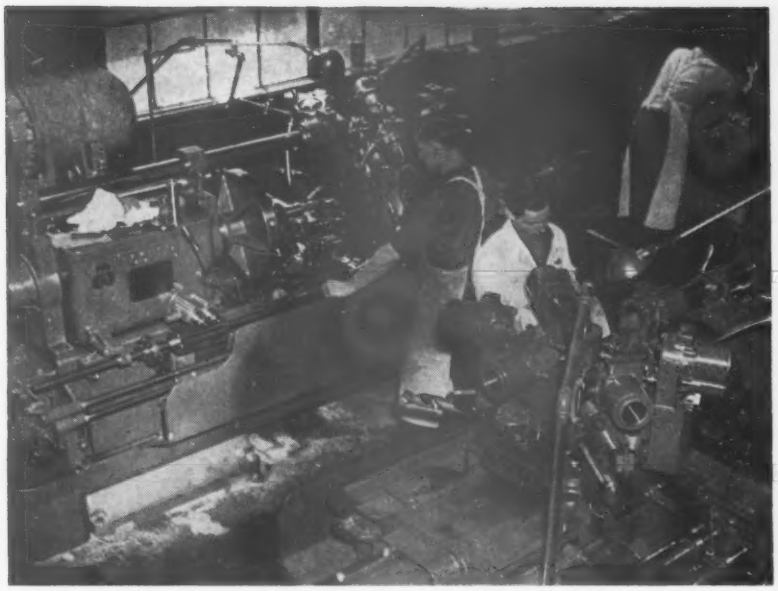


Figure 1

Two Foster turret lathes are used for machining the axle housing for the landing gear.

worth of machine tools. Production of planes in the old Kenmore plant in Buffalo having an area of 720,000 square feet was ten a day until expansion into the new plants was started. With the new plants, production will, of course, be several times as great.

Even before the construction of the new plant, the company had the largest machine shop in the aircraft industry. As the final assembly department is moved into the new plant, additional space is being made available in the old building for the further expansion of the machine shop there. This enlarged shop together with the mammoth machine shop being installed in the new plant will give a total capacity far greater than anything previously conceived in the industry.

Use of Universal Machines

Experience has indicated the advisability of universal machines. These machines are frequently tooled for operation as single purpose machines, and are easily adaptable

OPERATIONS SHEET FOR AXLE HOUSING

Steel Forging			
HOLD in boring fixture. **FACE** cutter side of flange to 3-9/16". **TURN** outside diameter of flange to 6-9/16" and **FACE** to 7/32" thick. **SPOT DRILL** and **REAM** 2.500" hole to 2.375".	Screw Machine		
MOUNT on plug in fixture. **FACE** end to 5-1/16" from center of axle hole. **DRILL** 1⅝" diameter hole to 1⅜" diameter 4" deep and **FLAT BOTTOM** to 4⅜" deep. **DRILL** 1¼" hole to ¾" diameter thru. **ROUGH TURN** 2.419 diameter to 2-35/64".	Screw Machine		
REMOVE flashing.	Polishing Wheel		
INSPECT			
HEAT TREAT to 150,000 psi Tensile Strength.			
PREPARE for Rockwell.			
INSPECT for Rockwell "C" 32-36.			
SAND BLAST.			
STRAIGHTEN flange.	Bench		
MOUNT in boring fixture. **FINISH FACE** outside of flange. **TURN** flange dimension and **BORE, REAM** 2.500" hole thru. **CHAMFER** 45° x 1/16".	Screw Machine		
		DRILL (4) 5/16" holes. **DRILL** and **REAM** (2) holes 5/16" diameter and **DRILL** (2) 23/64" diameter holes thru sides of axle hole and **SPOT-FACE.**	Drill Press
		MOUNT on 2.500" diameter plug fixture. **FACE** end to 5¾" to center of axle. **DRILL, BORE,** and **REAM** 1⅝" diameter. **FLAT BOTTOM** to 4⅜". **DRILL** 1¼" diameter thru. **TURN OD** to 2.419" back 3½ from end and **CHAMFER** 45° x 1/32" from taper to 2" diameter and ¾" deep.	Screw Machine
		REMOVE burrs.	
		STAMP part number.	
		INSPECT.	
		CADMIUM PLATE.	
		INSPECT.	
		MAGNAFLUX.	
		FINISH as per specifications.	
		INSPECT.	
		ASSEMBLE.	

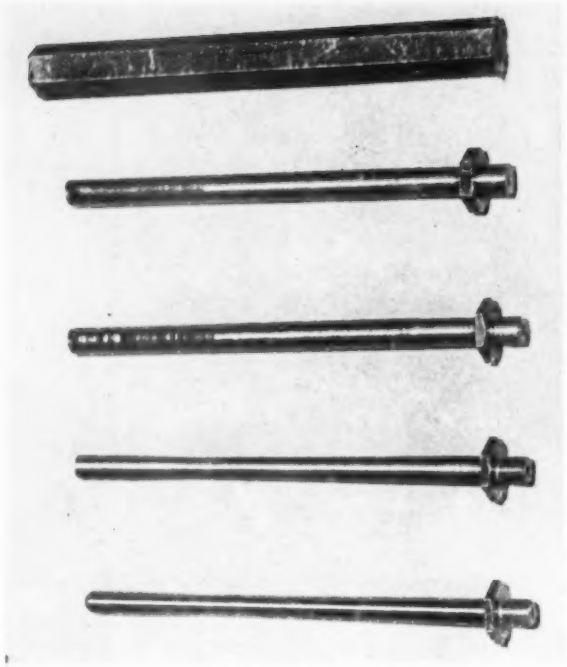


Figure 2

Five stages in the production of the metering pin for the landing gear are illustrated, top to bottom: 1, original bar stock; 2, pin roughed out on screw machine; 3, pin after shaping head end and turning small radius; 4, pin after threading and turning long taper; 5, pin after grinding long taper.

to the constant design changes which are made in the aircraft industry. It has been found that special purpose machines lose their advantages in most instances, because of these design changes.

A major staffing problem has been created by the expansion of the machine shop. Because of the close tolerances required and the use of universal machines with special set-ups, experienced operators are generally required. The Company has crowded as many machines and men (13,000 in a plant designed for 8,000) as possible into the old plant during recent months and intends to move a large part of this force into the new plant and then bring the two plants to capacity by the infiltration of new men. Unskilled men are taken on as "Observer-Trainees"; after an Operator's Course and a total period of from six to eight weeks, become sufficiently skilled in the operation of one or two machines so that they can be left in charge of them under ordinary operating conditions.

Machining Landing Gear Parts

Parts for the landing gear of the P-40 are machined in this shop. The forging for the axle housing is machined on two Foster turret lathes *(Figure 1)* which are set up facing each other so that one operator can handle both machines. The housing is held in a Foster-Barker chuck with specially designed jaws. Boring and facing operations *(see operations sheet)* are carried out with four operations performed in three positions of the turret, and one tool each being carried in the front and rear slides.

The housing is then transferred to the second machine when the machined face is held in a fixture fastened to a face plate. Six operations are performed in four positions of the turret. Three of these are performed in one position, and one each is performed in the other three. A single tool is carried in the rear slide. A sulphur base oil is used on these operations, as well as on all other machining operations on steel forgings on bar stock.

A precision part used in the landing gear is the metering pin. This pin must be held to tolerances of .0005 inches for accurate metering. As will be seen from the illustration *(Figure 2)* it has a long taper which is followed by a shorter reverse taper, followed in turn by a taper to the rounded end. This pin is roughed out from hexagonal bar stock on a Gridley Automatic Screw Machine. It is then

OPERATIONS SHEET FOR METERING PIN

Hexagonal Steel Bar	
HOLD in collet. **FORM** .490" diameter to .530" diameter. 1/2" diameter for thread to 9/16" diameter. Turn .530" diameter full length and cutoff.	Gridley Automatic Screw Machine
CENTER.	Centering Machine
HOLD between centers. **FORM** 1/2" diameter for thread 9/16" long 1" diameter. Shoulder 3/36" x 13/32" diameter recess and **CHAMFER** 45° x 3/64".	
HOLD between centers. **FINISH** back of head.	
HOLD between centers. **THREAD** 1/2" x 20NF3 thread.	Thread Mill
HOLD in temperature adapter. **ROUGH TURN** taper.	Monarch Lathe
ROUGH GRIND taper.	Cincinnati Centerless Grinder
FINISH GRIND as per B/P.	
HOLD between centers. **FORM** radius on long end.	
REMOVE all burrs.	
STAMP part number.	
INSPECT.	
MAGNAFLUX.	
ASSEMBLE.	

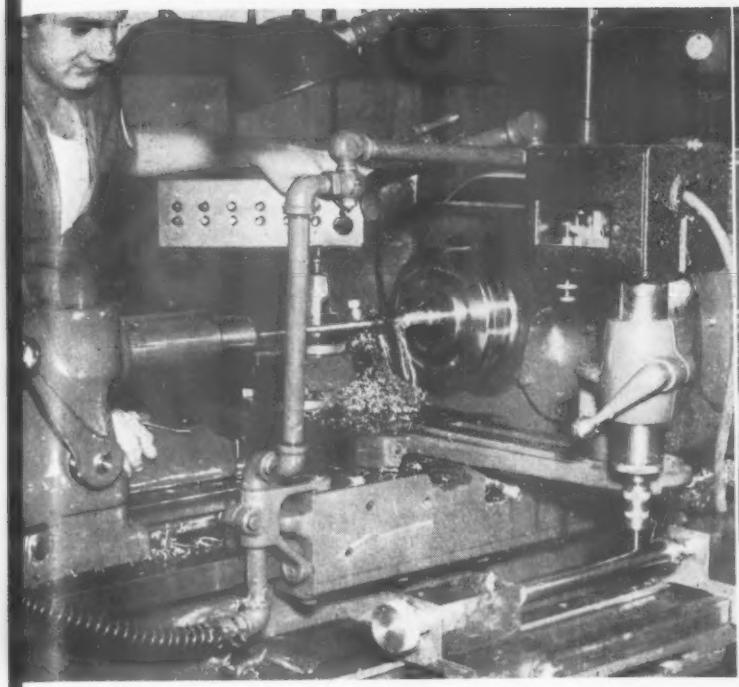


Figure 3

This Monarch Lathe is used for turning the long taper on metering pin. The Keller attachment in foreground controls the cut.

Figure 4

Cincinnati Centerless Grinder for finish grinding the long taper on the metering pin. The dressing attachment shows in upper right corner of picture.

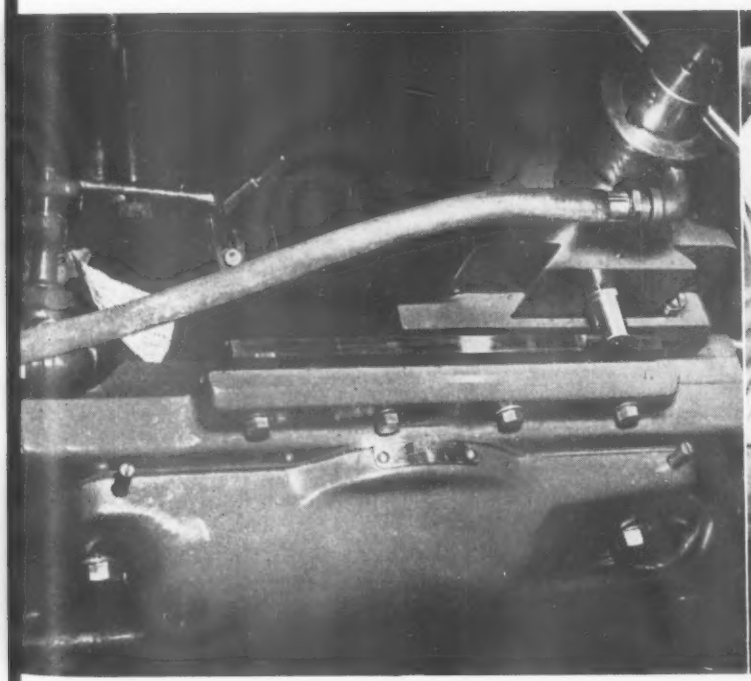


Figure 5

Special Cam Attachment which controls the dressing attachment used on the grinder illustrated in Figure 4.

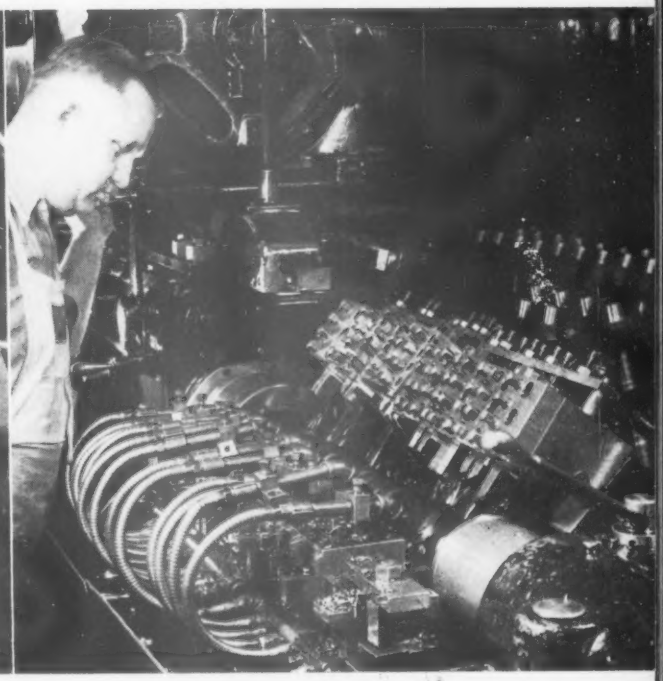
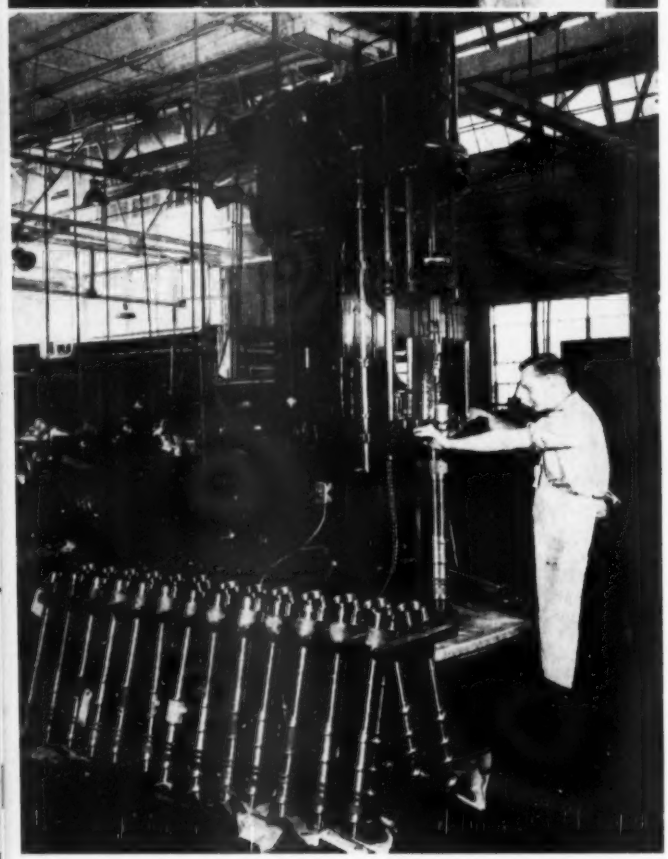


Figure 6

Additional equipment designed by Curtiss Tool Engineers is used on this Fay Automatic Lathe in a set-up involving 30 tools for turning oleo cylinder.



centered and threaded, the head is finished and radius from nut to taper is turned. The pin is placed on a Monarch lathe with a special Keller attachment *(Figure 3)* where the taper is turned to within .010 inch of finished size. The Keller attachment controls the contour of the cutting tool and cuts the delicate tapers necessary for accurate metering.

The pin is finish ground in a Cincinnati Centerless Grinder *(Figure 4)* and is held to its final tolerance of .0005 inches. The pin rests upon a specially designed work rest blade. The dressing attachment is specially designed and is controlled by a precision cam attachment *(Figure 5)* for dressing both feed and grinding wheels. This cam is cut to the finished contour of the pin and a finger passing along its surface controls the movement of the dressing attachment.

Drilling the Oleo Cylinder

The forging for the landing gear cylinder has an initial weight of 115 pounds. After machining it has a weight of 19 pounds. This cylinder for the landing gear, or oleo as it is called, is turned in a Fay Automatic lathe *(Figure 6)* which is set-up with 30 tools.

The cylinder is drilled in a Baker Inverted Vertical Drill *(Figure 7)*. This unusual inversion is necessitated by the depth of drill. Because the part is inverted and drilled from the bottom, chips fall out of the hole and clogging is prevented. The hole is drilled 27 inches deep and 2¾ inches in diameter. The drills used on this operation are oil hole drills, made in short lengths and used in special holders. These holes running up through the drill, supply a flow of coolant pumped up to the drill point. The cylinder drilling operation requires 74 minutes. However, the machine is built to drill two cylinders simultaneously so that machine time per cylinder is cut to 37 minutes.

This operation was originally performed with full length oil hole drills. It was found that they wore down at the rate of about one inch per month. The drills soon became too short and 27 inches of perfectly good drill had to be scrapped. This situation was remedied by the use of a short stub drill and a holder. The stub is inserted in this long holder and driven by a National Spline Taper Drive Shank until completely worn out, when a new stub is inserted. These stub drills have an initial cost approximately 40% below that of the full length drill and in addition may be used up completely whereas much of the

Figure 7

Baker inverted drill used to drill oleo cylinders and pistons.

Figure 8

This Barnes Hone is used to place a mirror finish on the inside of the oleo cylinder.

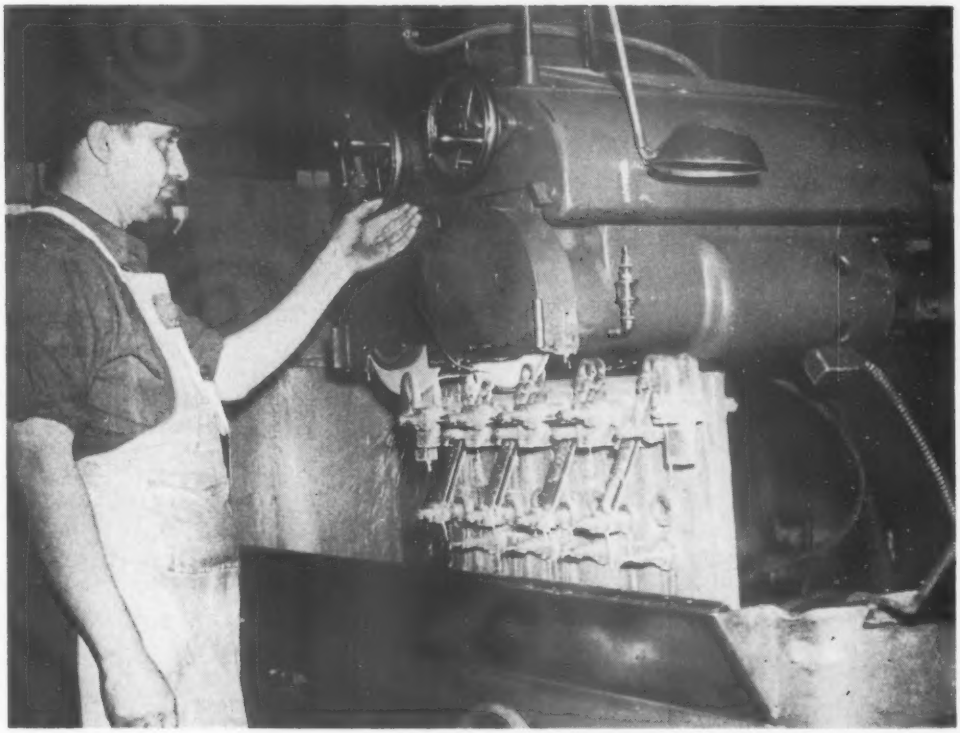


Figure 9

Accurately parallel surfaces are ground by this Thompson straddle grinder on inside surfaces of the oleo link.

full length drill had to be scrapped. This change has resulted in substantial savings to the company.

The cylinder is heat treated to a hardness of 180,000 psi tensile strength and a Rockwell "C" test of 38-42. Final boring is done on a Gisholt 3A using carbide tools of special design. Both internal and external threads on the cylinder are milled on a Lees-Bradner thread mill using the climb cut method.

The piston for the landing gear is also turned in a Fay Automatic and drilled in the Baker Inverted Vertical drill. Drilling time is one hour on one piece for both ends, or a machine time of thirty minutes since two pistons are drilled at one time. The landing gear struts are ground on a 10″ Norton Grinder x 48″ between centers.

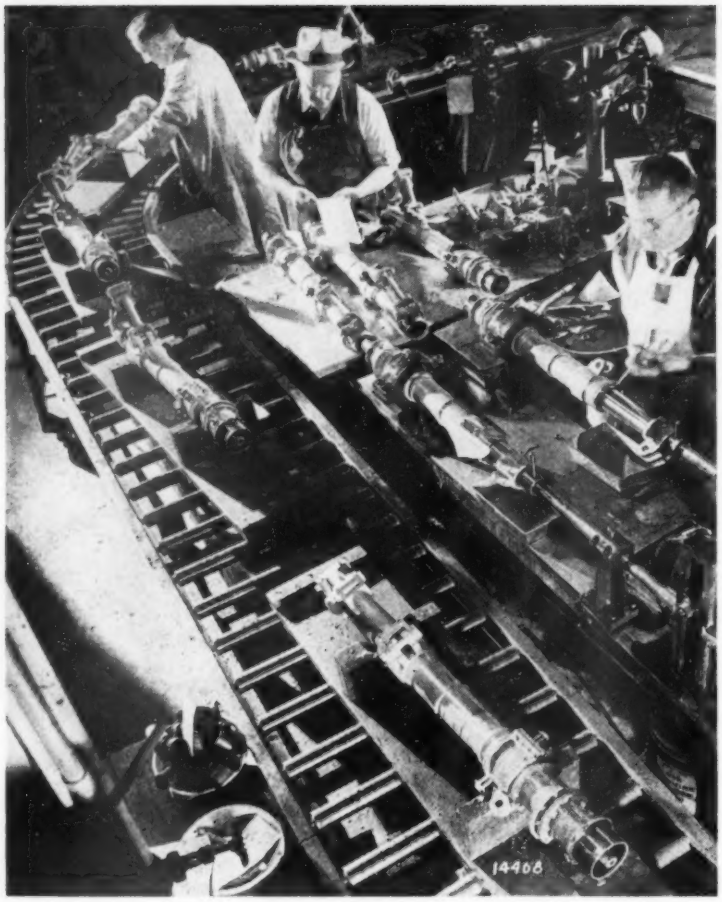
After the cylinder has been internally ground it is honed on a Barnes *(Figure 8)* which removes .010 inch and produces a mirror finish.

Use of Straddle Grinding

An unusual operation in the production of the landing gear is performed on a Thompson Straddle Grinder *(Figure 9)*. The part is the oleo link. The two interior faces at the end of this link must be finish ground to close limits and parallelism. A specially designed fixture holds four of the links for grinding at one time. The links are carefully placed in the fixture and checked to insure proper positioning in a straight line. There are two grinding wheels placed tandem. These are rigidly mounted so that their axes are parallel, but are moveable along the direction of these axes. The surfaces of the wheels are dressed for perpendicularity to the axis. The table upon which the fixture holding the links is mounted is set in motion and at each pass the links straddle the two tandem wheels. At the same time the distance between the parallel planes of the grinding surfaces of the wheels is increased until checking with a gage block indicates that the proper cut has been taken.

The landing gear strut sub-assembly is made in the Bench Assembly Department *(Figure 10)* conveniently located adjacent to the machine shop. A horseshoe shaped conveyor is used for the assembly. Struts are laid in wooden jigs which may be moved along on the roller conveyor as desired. Skilled workmen perform the assembly operations on the conveyor or in machines conveniently located alongside.

A new Cincinnati Vertical Hydro-Tel milling machine *(Figure 11)* is used in the machine shop for milling operations which require a winding path. An attachment is used upon which a model is mounted with a tracing finger to follow the contour. Control of the machine is accomplished through hydraulic mechanisms and the skilled operator is able to deftly follow the pattern in milling the most intricate surfaces.



PURSUIT

Figure 10

Final assembly of the landing gear strut takes place on this horseshoe shaped conveyor.

A group of Van Norman milling machines is used for experimental purposes on intricate fittings where compound angles are involved.

A new Lees-Bradner thread mill of unusual length is being installed. This mill has a 24″ swing and a 102″ base.

The Pratt & Whitney Keller Machine was designed originally for use as a die sinker, but has since been adapted as a production machine (for example THE TOOL ENGINEER, Jan., 1941, p. 51). In the machine a mechanical-electrical hook-up is used through which a tracer passing over the surface of a model causes a cutter to reproduce, three dimensionally, the shape in metal. Used here as a production unit *(Figure 12)* the Keller machine produces a support used in the wings of the plane by tracing a master form.

Bakewell Precision Tapping Machines *(Figure 13)* are used for a variety of tapping operations. Parts are placed in jigs which are free to slide around on the table so that a number of threads on a single surface can be tapped in quick succession. In these machines the tap is used only as a cutting tool, the feed is controlled by a lead screw. A clutch adjustable to the safe torque resistance of the tap will slip when normal stress is exceeded, and thus eliminate tap breakage.

An Ex-Cell-O Diamond Boring Machine is used for increased production and accuracy on a variety of operations. The machine is universal and is easily adapted to the various operations.

A Heald Sizematic 72A3 is used for grinding small parts where quantity production parts are available. Four exhaust stack flanges are surface ground at one time on a Thompson Surface Grinder. Unlike the straddle grinder previously described this is a conventional machine in which the work passes from side to side under the revolving grinding wheel while the wheel shifts forward and backward across it. A hydraulic operated fixture is mounted on the table which holds four parts for grinding at one time.

Vertical Shaper in Tool Room

In the tool room a Pratt & Whitney Vertical Shaper *(Figure 14)* is used for slotting operations in the production of dies. In the notching and perforating die illustrated this type of machine offered the only way of getting at the slot to be cut. The machine is universal and has extremely accurate controls. The revolving table is graduated in degrees and all controls have vernier adjustments.

Among other unusual machine shop set-ups is one for drilling a variety of holes in the bearer tube for the engine mounts *(Figure 15)*. This tube has been heat treated to a tensile strength of 150,000 psi and is drilled with a

variety of commercial drills as called for by the different holes. Because of the variable speeds required these drills are driven by an air motor, the speed of which is easily controlled.

Fosdick drills with adjustable columns *(Figure 16)* are used where it is desired to drill two holes at one time in a part held in a jig. The vertical columns may be adjusted horizontally in a direction parallel with the front of the machine. This adjustment makes it possible to secure any desired distance between centers, within limits, of two holes drilled simultaneously by the power fed spindles. After a batch of one part has been drilled, the columns can be quickly adjusted to fit another jig and another part.

A milling operation using a combination of cutters is performed on a Kearney and Trecker Milwaukee. The Cluster Fitting detail has a protruding lug which is to be milled on the sides and at the same time a slot 3/16 inch in width is to be cut through the center of this lug. Two pieces at a time are handled by the climb cut milling process. The slotting cutter is mounted on a spindle flanked at the proper intervals by the side milling cutters and the three cutters operate as one in performing the operation.

The other side of the Cluster Fitting detail consists of two flat surfaces meeting at an obtuse angle. This is per-

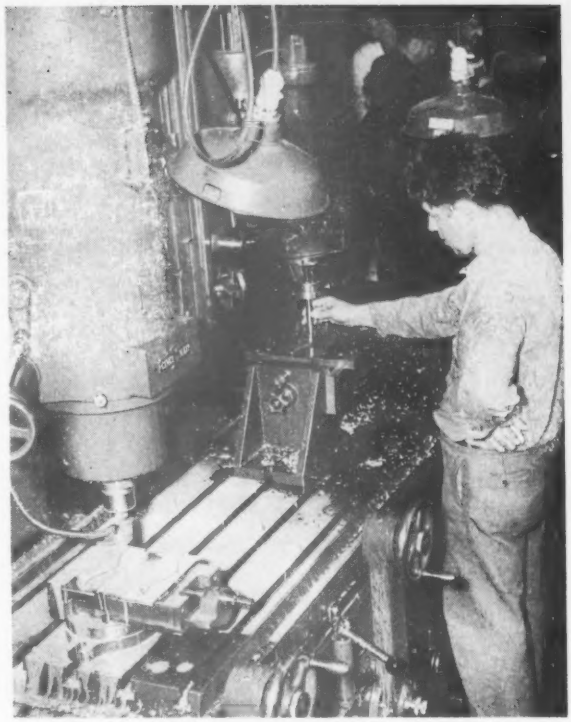


Figure 11
A new Cincinnati Vertical Hydro-Tel Milling Machine is used for milling operations which require a winding path.

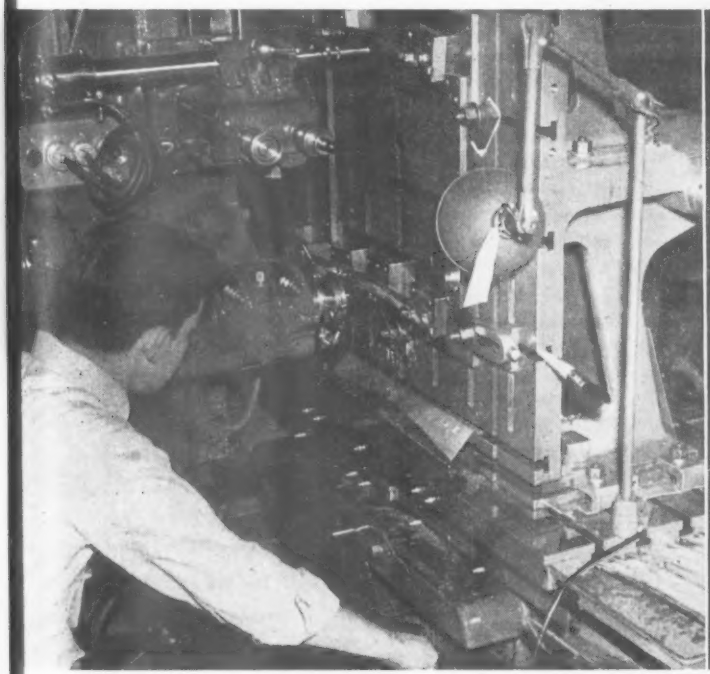


Figure 12
Used as a production unit the Keller Machine is producing supports used in the wing of the plane.

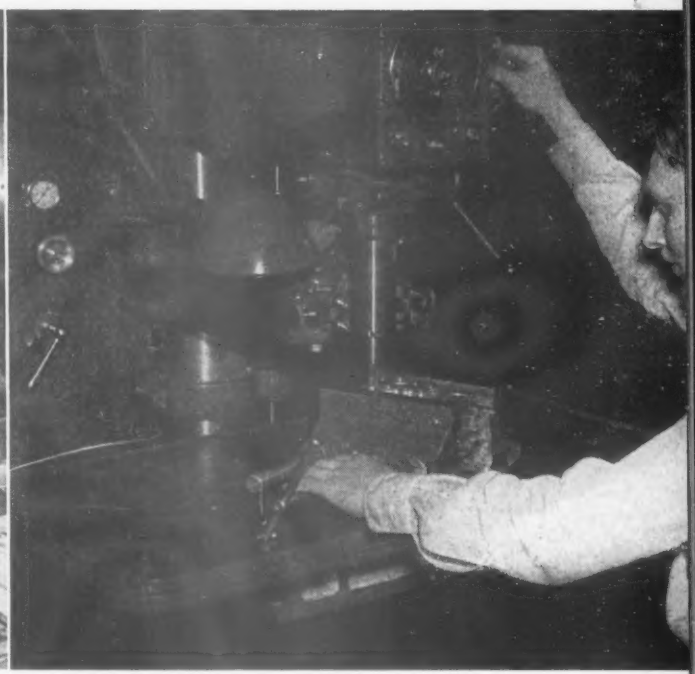


Figure 13
Parts are placed in jigs and a number of threads in quick succession are tapped on this Bakewell Precision Tapping Machine.

formed on a DeVlieg Milling Machine which mills to the start of the angle, indexes hydraulically and then finishes the cut.

Swaging Used on Tubes

Several Langelier Swaging Machines *(Figure 17)* are used for swaging motor mount tubes, blast tubes, control sticks, and similar operations. In hot or cold swaging the tube to be tapered or balled on ends is clamped in place on the table in jaws of special design (lined with fibre) and is fed automatically into the swaging chamber. The swage blocks each look like half a die. As these two blocks rotate at high speed they separate and then hammer together. The hot tube is fed into the tapering cavity in the blocks and is rapidly hammered down to a smooth taper, the angle of which is controlled by the blocks and the length of which is controlled by the distance that the tube is fed into the machine.

More difficulty has probably been encountered in machining the part known as the "cornerstone" than any other part the machine shop has ever handled. This steel forging *(Figure 18)* has a multitude of odd angles and faces to be machined. It is used in assembly as an attaching point for the landing gear struts, the engine bearer mounts, and the fuselage. In the newer models it has been replaced by parts of simpler design.

The cornerstone is machined in 42 operations, and because of its unusual nature, we shall consider them in some detail. The steel forging is first taken to the bench and flash removed so that the casting will fit the intricate drill jig. The forging is mounted in this fixture so that the straightened flange is parallel to blocks with slotted end of forging up against angle blocks. This is checked with a sight gage. The larger holes are then rough drilled and the long deep hole drilled and reamed. The part is placed on a milling machine and one slot and surface are rough milled to provide a clamping point. The part is heat treated, sand blasted, magnafluxed, and inspected.

The large holes are then finish drilled and straddle milling is performed on the large slot. The flat surfaces are finish milled in a series of operations and the numerous small holes are drilled. A clear picture of the machining of this part may be gained from a study of the illustration and the operations sheet.

Figure 14

Slotting operations in the production of dies are performed on this Pratt and Whitney Vertical Shaper.

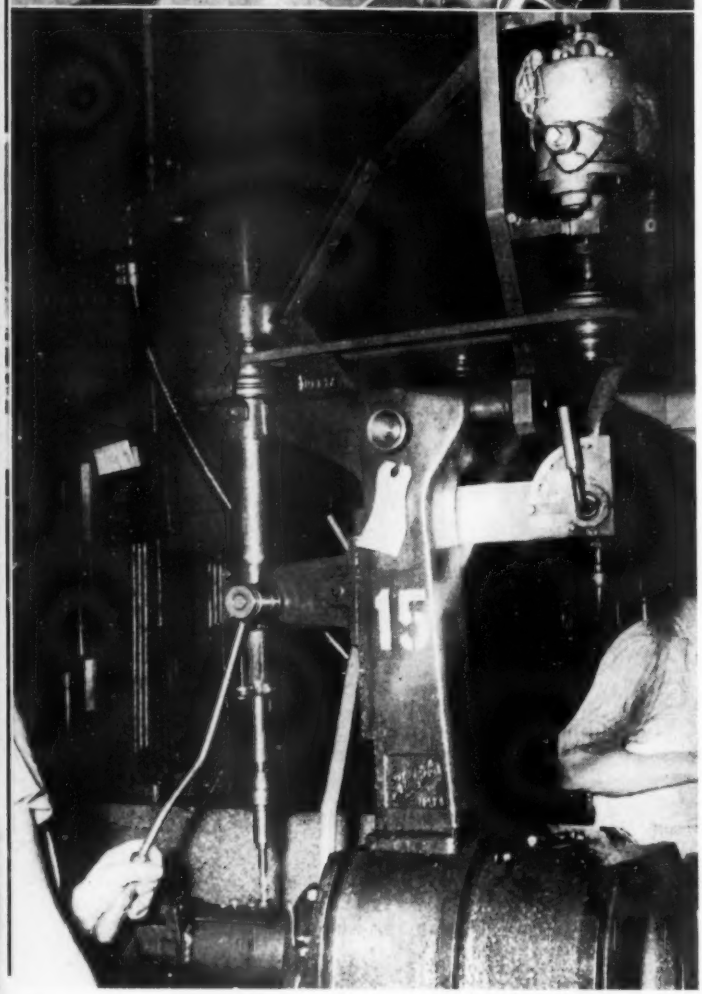


Figure 15

An air motor, speed of which is easily controlled, is used for drilling a variety of holes in heat treated bearer tube.

PRODUCTION

Sheet metal parts are produced in a variety of ways. An 18-foot Cincinnati Shear is used for trimming skin sheets to width and length. Stops are fastened to the table to control the width, and arms built out from the table with stops at the end control the length.

Dies are made in the foundry of scrap aluminum. A plaster of Paris cast of the part is made and this is used in casting the dies. After removing from the mold, the dies are hand polished *(Figure 19)* and tested. These dies are used in both drop hammers and hydraulic presses. Parts are produced by the use of aluminum and zinc alloy dies and punches; aluminum dies with rubber rams, and wooden dies faced with steel *(Figure 20)*. The type of dies used is dependent upon the shape of the part, the type of press selected, and the quantity of production required.

A number of different small parts are produced in one stroke of a Lake Erie Hydraulic Press *(Figure 21)*. The press exerts a pressure of over 2500 tons and is equipped with three tables called shuffle boards which are rolled into position under the press ram. While one shuffle board is in the press, a second is being loaded and the third is being unloaded.

Producing Sheet Parts in Drop Hammer

An unusual production method involves the use of a Chambersburg Drop Hammer *(Figure 22)* and aluminum dies. There is some discrepancy in the cast dies and rubber draw pads are used during the hammering operation. The sheet to be pressed is laid over the male die, which is fastened to the bed of the hammer. A built up section of several layers of rubber is placed over the sheet metal, and the ram, to which is attached the female die, is brought down for several light strokes. The rubber pad is removed and one of thinner section placed between the dies for several additional strokes. The number of rubber pads is dependent upon the intricacy of the part being formed. The final hammering operation takes place without the use of rubber pads. Before starting the operation emery cloth is used on the edges of the sheet to be formed—as any scratches left might cause cracks to start when the metal is hammered into shape.

Production of flat sheet parts of intricate shape is done by routing. Several sheets of metal (the number depending upon the thickness of the sheet) are clamped to the table of an Onsrud Routing Machine *(Figure 23)* and a

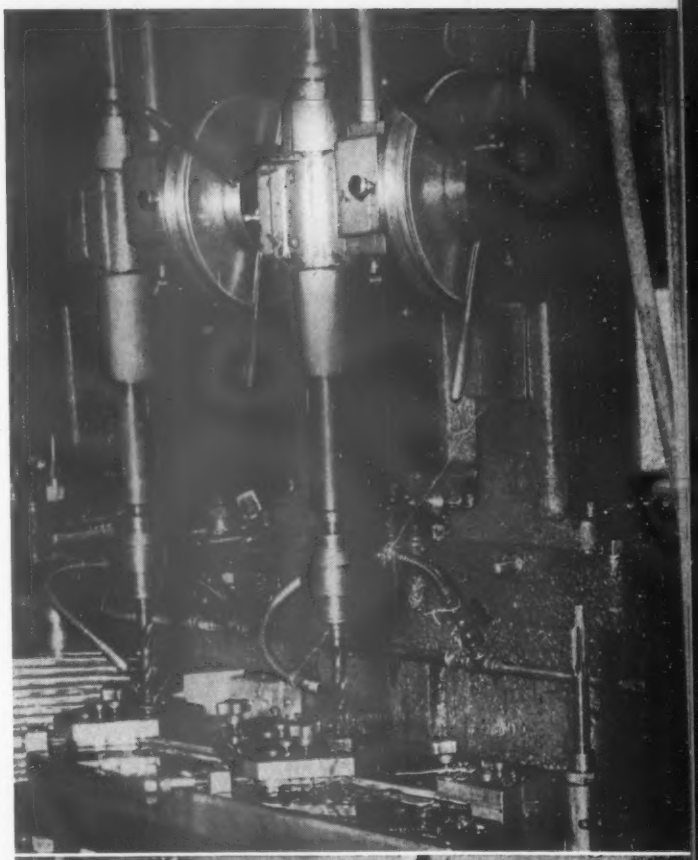


Figure 16

These Fosdick Drills in which columns are adjustable along the base for variable distances between drill centers are extremely versatile.

Figure 17

Tube which has been tapered is withdrawn from the swaging chamber of this Langelier Machine.

PURSUIT PLANE PRODUCTION

OPERATIONS SHEET FOR CORNERSTONE

Steel Forging	
REMOVE flash in corner to locate in drill jig.	
MOUNT in fixture. **CHECK** setting with sight gage.	
ROUGH DRILL 1.510" hole to 1⅜" diameter by 2¾" deep. **DRILL** and **REAM** hole one inch diameter by 7⅛" deep. **TILT** table 14° 24' sight and lineup bushings. **ROUGH DRILL** 1.255" hole to 1⅛" diameter by 2-15/16" deep.	Drill Press
SETUP on 4" parallel blocks. **ROUGH MILL** 1.813" slot to 1⅝" for clamp use.	Milling Machine
SETUP on angle plate. **ROUGH MILL** ⅞" dimension to 15/16".	Milling Machine
REMOVE burrs.	
INSPECT.	
NORMALIZE.	
HEAT TREAT to 150,000 ts.	
PREPARE for Rockwell.	
INSPECT for Rockwell "C" 32-36.	
SAND BLAST.	
MAGNAFLUX.	
INSPECT.	
MOUNT in fixture. **FINISH DRILL** and **REAM** 1.255" diameter hole. **DRILL** and **REAM** 1.00" diameter hole. **DRILL, REAM,** and **SPOTFACE** 1.510" diameter hole. **TILT** table 14° 24' sight and lineup with bushing. **SPOTFACE** end of 1.255" hole to setting gage.	Drill Press
STRADDLE MILL 2.102" dimension, use .016" feeler.	Milling Machine
ROUGH FACE MILL 2-19/32" dimension allowing .020" to .025" for finish. Use indicator to square forging to holes.	Milling Machine
FINISH FACE MILL 2-19/32" dimension.	Milling Machine
FACE MILL inside edge of flange. Use surface gage to lineup forging parallel to bottom.	Milling Machine
FINISH MILL .876" slot.	Milling Machine
MOUNT in fixture using angle blocks. **SLAB MILL** top off fork end to clean-up both sides even.	
ROUGH STRADDLE MILL .190" dimension to 2-9/32" overall.	Milling Machine
STRADDLE MILL .190" dimension.	Milling Machine
STRADDLE MILL .497" dimension.	Milling Machine
FINISH end 27/32" dimension faces to remove balance of stock left by previous operation.	Vertical Mill
FINISH MILL 1.813" slot.	
MILL FACE ⅞" dimension to .885".	Milling Machine
ROUGH MILL 9.210" dimension, allow 1/16" for finish milling.	Milling Machine
STRADDLE MILL 1½" dimension.	
MILL surface to 1.125" depth. **MILL** surface to 1.500" depth. **MILL** 45° and chamfer upper end 18½°.	Vertical Mill
DRILL and **REAM** (4) .314" diameter holes. **DRILL** and **REAM** (2) .439" diameter holes. **DRILL** 1½" hole.	Drill Press
END MILL ⅜" radius to clear ¾" diameter spotfacer on .314" hole on side of large lug. Do not finish to depth because spotfacing will take care of same.	Vertical Mill
SPOTFACE (3) .314" holes ¾" diameter as per gage. **SPOTFACE** .314" hole ¾" diameter to .250" dimension. **SPOTFACE** (2) .439" holes 1" diameter to ⅝" from center of slot. **SPOTFACE** (2) .439" holes and (1) .314" hole on opposite side to overall B/P dimension.	Drill Press
DRILL and **REAM** (5) .439" diameter holes. **DRILL** and **REAM** (2) .564" diameter holes to 7/16" deep and tap ¼" 28NF3 thread. **DRILL** and **REAM** 1.00" diameter hole, countersink 45° x ⅛". **DRILL** and **REAM** (10) .251" diameter holes.	Drill Press
FINISH TAP to depth (3) ¼"-28 and (1) ⅛" pipe tap hole.	
CLAMP jig to table. **DRILL** ⅛" diameter hole in center to 1" diameter. **DRILL** 1" hole to 3-5/16" diameter. Drill ⅛" diameter drain hole thru.	Drill Press
DRILL and **REAM** (3) .376" diameter holes. **DRILL** (1) 21/64" diameter hole and tap ⅛" NST pipe thread. **SPOTFACE and BACK SPOTFACE** .376" holes to 11/16" diameter.	
DRILL .116" hole thru with electric drill.	
DRILL and **REAM** (3) 23/64" diameter and **SPOTFACE** 11/16" diameter.	
DRILL (1) ¼" diameter hole thru and **SPOTFACE** one side to ⅝" diameter. Check overall thickness of forging and **SPOTFACE** equal amount from each side to 1" dimension.	
SPOTFACE opposite side ⅝" diameter to 1" dimension and burr all holes.	Drill Press
GRIND off excess flashing all around and excess stock to blend with milling.	
MILL off surplus metal for clearance for bomb sway.	Milling Machine
MOUNT in fixture.	
MILL 9/16" slot to ⅝" dimension.	
REMOVE all burrs and **FINISH.**	
INSPECT.	
CADMIUM PLATE.	
INSPECT.	
FINISH per specifications.	
INSPECT.	
ASSEMBLE.	

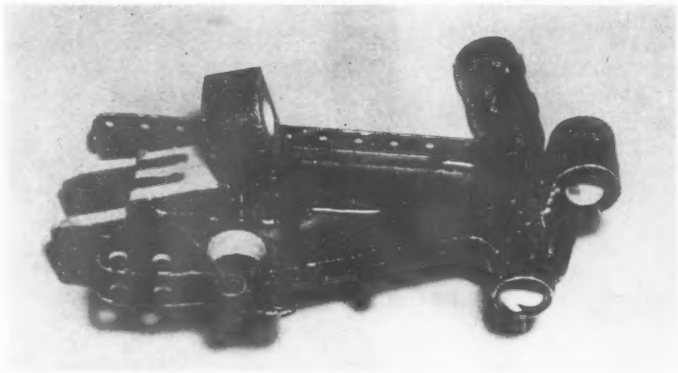


Figure 18

A multitude of odd angles make the "cornerstone" a difficult piece to machine.

template placed over them and screwed down to a table. A collar on the cutting tool follows the contour of the template and causes the cutting tool to cut the proper shape in the stack of metal sheets. This method is also used for blanking sheets to be formed in hydraulic press operations.

Several lines of Niagara presses *(Figure 24)* are used for punching, forming, and blanking operations on the thousands of small parts which are used.

Special skill is required throughout the sheet metal fabrication department. Aluminum requires different radii from that of tin or galvanized iron and precautions must

Figure 19

Final polishing of aluminum dies is done by hand.

Figure 20

The sheet steel wood dies used in this Lake Erie Press are particularly adaptable to large deep draws in sheet aluminum.

be taken here, as throughout all operations, to avoid scratching and scarring of the parts.

Production of Tubular Parts

The plane includes many tubular parts. Bench machines are employed in the bending of tubing and conduits and the drop hammer is used in forming the stainless steel exhaust stack sections. Power machines are used for the larger sizes of tubing. Subassemblies are performed by hand.

All aluminum and copper alloy tubing which is use in the plane is tested for pressure with a booster pump. A fixture holds seven such tubes for testing at one time. Some tubes are water tested—submerged in water while under pressure and examined for the presence of possible leaks. All aluminum alloy castings are also tested at the water bench for porosity cracks.

The motor mount is of welded construction fabricated from tubing with forged fittings welded on the ends. After welding the mounts are heat treated, sand blasted, magnafluxed, straightened, and machined. This welded tubular construction offers difficulties in machining but is strong and light in weight.

All steel forgings and parts made from bar stock are also magnafluxed after they have been heat treated. rubber composition is used for lining sand blast barrels to minimize wear of the lining.

An unusual occupation encountered in the plant is that of cable splicing. The plane is controlled by these flexible cables which are attached by means of terminal loops. These loops must be perfect in kind of splice, tensile strength, and size. Usually the cable must be of a precise length after the loops have been placed at each end. The loops are formed by running the end of the cable around a small metal collar, unweaving the cable at the end and splicing the small wires in among the portion of the cable which leads from the collar. When this splice has been taped the loop is small, neat, and as strong as the cable itself. The work is done by hand using pliers of special design and a bench fixture also of special design.

The assembly of the Curtiss P-40 Pursuit Plane is accomplished largely by riveting. This plane contains approximately 70 thousand rivets, of which 38 thousand are external. These external rivets have been the source of considerable study. Flush riveting is desirable because the smooth skin which it makes possible, increases appreciably the speed of the plane—however, the thin skin sheets make flush riveting difficult because of the danger of rivet heads which are set flush pulling through the skin. This difficulty has been solved by the development of a dimpling machine which makes possible a larger contact area between flush rivet and skin. All outside rivets are now of the flush type, and about 15 miles per hour has been added to the speed of the plane as a result.

PRODUCTION

Curtiss was the first airplane company to fully flush rivet a service airplane.

The fixtures which are used in wing and fuselage fabrication are structural steel assemblies held to precision limits. These fixtures are set up with the aid of a transit to insure accuracy.

Wing Assembly

The wing assembly starts in two halves which progress together down the line from fixture to fixture and are then bolted together to form a single wing. Assembly of each half wing starts with the curved skin leading edge. To this, light aluminum stringers are flush riveted. These stringers are riveted to the inside of all skin surfaces at intervals to give additional strength and stiffness. These stringers are largely riveted to the skin sections before the skin is placed in the assembly fixtures. The skin is dimpled for flush riveting, the stringers are held in position by cleco clips until they are riveted. These clips are quickly placed through rivet holes in skin and stringer by means of a special pair of pliers. When the pliers are removed the inside end of the clamp expands and holds skin and stringer together. Rivets are placed in position by a magazine holder and applicator and are riveted on a General Engineering Company Gang Riveter *(Fig. 25)*. This machine sets seven to twelve rivets at one time. The skin with stringers attached is placed on the large riveter table and can be moved along this table easily to bring a new set of rivets into position for setting.

The leading edge of the wing section, with stringers attached, is placed in position in the sub-assembly jig. Bulkheads are then riveted into place at intervals, on the inside of this edge. These bulkheads are formed of aluminum sheet with holes to reduce weight. The metal at the edges of these holes is pressed into a channel shape for added strength. The bulkheads extend back a few inches from the leading edge. A spar also made of sheet aluminum alloy, is then placed along the rear sides of the bulkheads and riveted to the bulkheads and to the skin. Another row of bulkheads are placed above this, followed by another spar; additional skin sections are placed in position and more bulkheads and spars are used. There are five main spars or webs in a wing section. Thus the wing is built up of flexible aluminum alloy sheet, but in a box construction which gives a strong finished wing. The wing is moved into larger jigs as the process continues and control wires and conduits are placed in position. All parts are made to

Figure 21

Three tables facilitate loading of this 2500 pound Lake Erie Hydraulic Press which produces a number of small parts in a single operation.

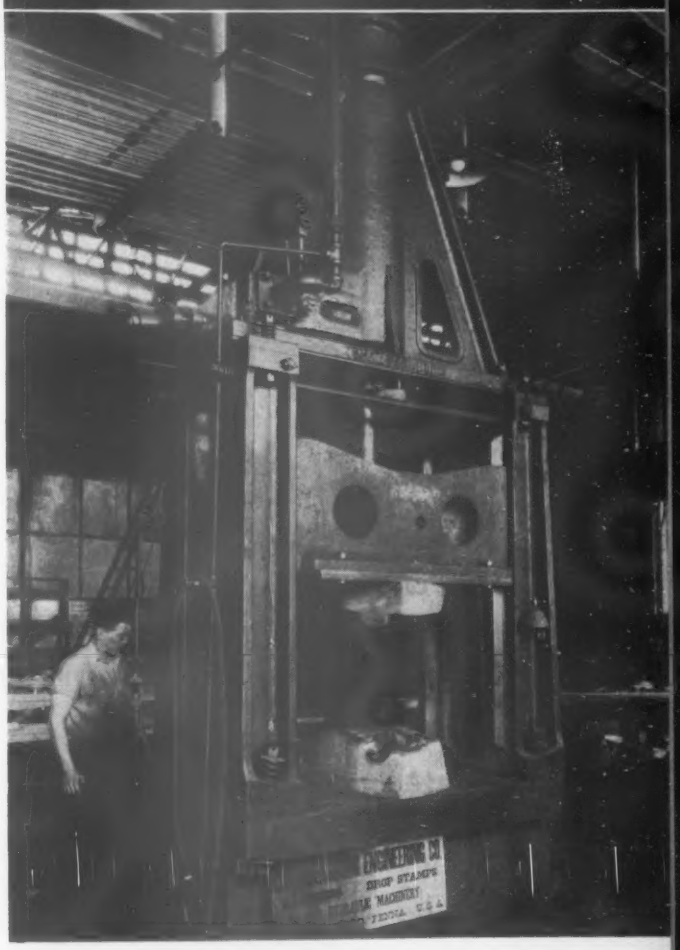
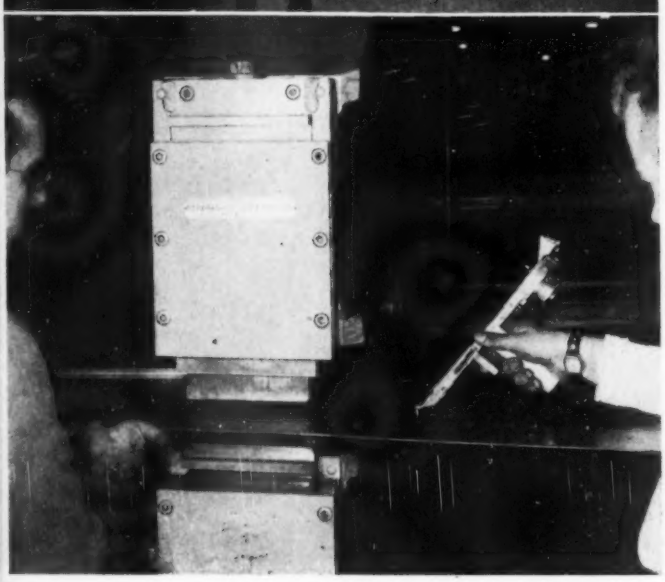


Figure 22

This Chambersburg Drop Hammer operating by compressed air is used with aluminum dies to strike out a number of parts.



fit precisely except on the center edge of the wing section. When a pair of wing sections is completed a small circular saw is used to cut off excess skin and stringers to produce a smooth edge for mating. The two wing sections are then bolted together to form the single wing of the plane. The control stick is attached to the top of the wing. The fuel tanks are placed in the wings as well as the retractable landing gear. Tail surfaces are produced in much the same manner as the wing. Ailerons and elevators are fabric covered and doped. This lends to lighter control loads of the plane and reduces vibration.

Assembly of the Fuselage

The fuselage is of monocoque, rather than steel tube, design. It is built up much as the wing is in precise fixtures and bucks. It is also made in two sections, top and bottom, which are riveted together. In the case of the fuselage, the skeleton is first built up of bulkheads and stringers and the skin is riveted to this frame. Rivets are placed in position and a coat of rubber cement is applied to keep them from bouncing out as the riveter is used. When the fuselage is completed and the two halves riveted together it is bolted to the top of the wing. The wing top serves as the floor of the single cockpit. The Allison in-line engine is mounted into place. The electrical and fuel systems are installed. The landing gear, production and sub-assembly of which were described earlier in this article, is installed. Controls are connected and other finishing touches made.

The cowling is fabricated from sheet metal sections made on hydraulic presses and drop hammers. The cowling is assembled by riveting. Assembly is done in rigid fixtures to assure interchangeability of cowlings.

All aluminum alloy parts are chromic acid dipped to insure paint adhesion, and then dip painted.

Plastics are now being used to make the star wheel in the ammunition box. This wheel, made of plastic, has a greater resilience, will wear longer, and is only about a tenth as heavy as the aluminum wheel previously used.

The new Curtiss plant at the Buffalo Municipal Airport is completely modern and thoroughly efficient in design and construction. Tool Engineers have carefully applied all their skill to developing the most practical production methods. It is a tribute to their skill and to the skill of all the others connected with the project that so large and carefully designed a plant could be conceived, designed, built, and put into operation in less than a year.

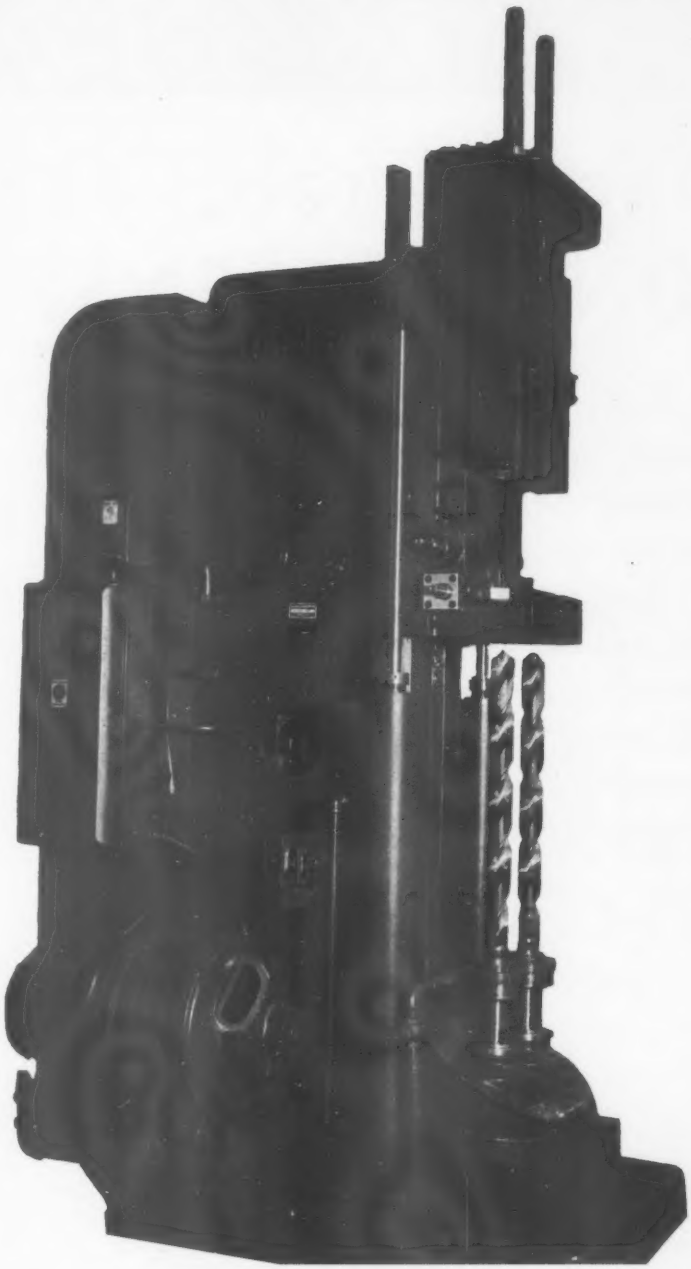
Figure 23
Sheet aluminum parts produced in small quantities are blanked out on this Onsrud Routing Machine.

Figure 24
Niagara presses do punching, forming, and blanking operations on the thousands of small parts which are used.

Figure 25
Stringers are riveted to skin sheets in this General Gang Rivitor. The rivets are being placed in position by a magazine holder and applicator.

BAKER »*Our Motto Since 1867:*

"MACHINES STURDY AND EFFICIENT, AS FINE AS CAN BE BUILT"



Model No. 30 HO—2 Spindles

Showing the latest in Production Inverted Drilling Machine for Aircraft Deep Hole Drilling.

MAXIMUM CAPACITY:
Main Drive Motor up to 30 H.P.

MAXIMUM SADDLE TRAVEL: 52"

FEATURES:

1. Alloy Steel gearing throughout.
2. Wide face helical gears and spiral bevels.
3. Forced lubrication for gear train and ball bearings.
4. Special knockout attachment for protection against overloading drills.
5. Two parts drilled at each cycle.

Machine adapted to handling drilling operations in deep hole aviation landing gear

Cylinders
Pistons
Sustaining rams
Oleo Struts
Crankshaft Front Ends
Propeller Shafts
Recoil cylinders for 37 mm Gun Carriages.

BAKER BROTHERS, INC., OHIO, U.S.A. TOLEDO.

STARRETT TOOLS

PROVIDING THE TOOLS FOR NATIONAL DEFENSE

Starrett Precision Tools are playing an important part in the production of modern implements of defense. By bringing sure accuracy, dependability and efficiency to the countless precision measuring and inspecting operations involved, they are helping to make American planes, tanks, ships and guns the finest in the world. The L. S. Starrett Company is making every effort to supply the greatly increased demand for precision tools — both in defense industries and for normal production — without sacrificing Starrett standards of accuracy and dependability. Write for Starrett Catalog No. 26 T.

THE L. S. STARRETT CO · ATHOL · MASSACHUSETTS · U · S · A ·

World's Greatest Toolmakers

Precision Tools... Dial Indicators... Ground Flat Stock... Hacksaws... Metal Cutting Bandsaws... Steel Tapes

ACME PHOTO

KEYSTONE

EXPLOSIVE RIVETS SPEED AIRCRAFT PRODUCTION

Explosive rivets made by Du Pont, a recent innovation, may prove an important factor in speeding American aircraft production and simplifying design.

Now being manufactured in commercial quantities, the rivet is of an entirely new type. A high explosive is secreted in a cavity at the end of the shank. Heat applied to the rivet head by an electric gun detonates the charge. The explosion expands the charged end of the shank, thus forming a "blind" head and setting the rivet.

The whole operation is performed from one side with greater ease and speed than is possible by any mechanical means now being used in aircraft factories.

Engineers estimate that from 800 fastening points in an all-metal pursuit plane to as many as 10,000 in the largest all-metal bomber are accessible only from one side. That fact has presented one of the most troublesome bottlenecks in the mass production of fighting planes.

Under the best mechanical methods now employed, a skilled workman can set about two to four of these "blind" fasteners a minute, after they have been placed in the holes. The equipment is comparatively costly.

The new DuPont rivets may be installed by one workman at a rate of 15 to 20 rivets a minute, once they are in place. The riveting gun or iron weighs less than five pounds. The rivets themselves weigh only about one-fourth as much a generally used "blind" fasteners of mechanical design.

So finely has the explosive charge been controlled, that the expansion it effects may be held within limits of .02 inch—truly an example of modern development and precision.

Two years of experimental work by the Explosives Department of the Du Pont Company, supplemented by extensive tests of the rivets on airplane production lines in recent months, stand behind the development. Engineers expect the invention to have wide applications in industry at large, and to effect radical changes in riveting methods and structural designs.

Much of aviation's phenomenal advance has been made possible by the development of the all-metal design, preeminently employing the lighter metals such as aluminum and magnesium alloys. This style of construction requires some 40,000 to 500,000 rivets or more per plane, according to the size. The job is one of the most exacting and tedious that confronts plane builders, and grows more so as planes become larger, which is the trend. For example, the recently completed B-19 Douglas bomber, largest ship of its kind ever built, is said to have 3,000,000 rivets.

Gang riveting machines, automatic hole-punching and rivet-driving devices, and the occasional replacement of rivets by high amperage spot welding, have tended to simplify the tremendous fastening problem to an important degree. However, these methods, together with the driving of conventional rivets individually by two-men crews—usually at a rate of two to three rivets a minute—are applicable only in assemblies which permit access to both sides.

There are many structures or portions of airplane structures which are totally or partially inaccessible from the rear. These require fasteners which are capable of being installed entirely from one side, usually termed "blind rivets." Many kinds of mechanical "blind" rivets have been developed, but in general they have compared unfavorably with "bucked" rivets in physical and structural properties, besides being difficult to install economically. So serious has been this difficulty that it has influenced airplane designs through the efforts of designers to avoid it.

The Onsrud routing operation pictured below is an important step on the Curtiss production line which is turning out ever-increasing numbers of aircraft for defense, such as the Curtiss P-40 shown at the right.

Accuracy... Economy... Speed

assured by ONSRUD Routers

Onsrud Routers and Drills assure greater accuracy, economy and speed. That's why 98% of the U. S. Aircraft Industry use Onsrud machines. That's why Curtiss Airplane Division, Curtiss-Wright Corporation says:

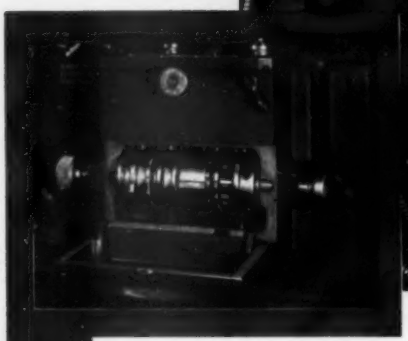
"The Onsrud Radial Arm Router is used to produce parts for which a blanking die would be uneconomical, either from the standpoint of size of the part, or number of parts to be produced. From three to eight sheets of stock, depending upon the gauge, can be routed by this machine at one time."

Onsrud Routing and Drilling Machine (illustrated above) can be obtained with two radial reaches . . . 84″ and 114″ . . . double and single arm mounting. Write today for complete specifications and recommendations.

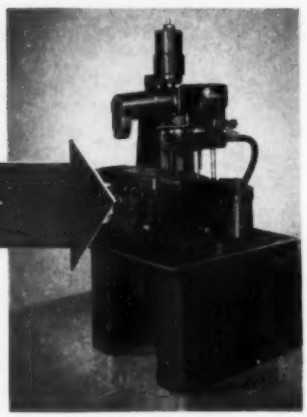
ONSRUD MACHINE WORKS, INC.
3907 Palmer Street, Chicago, Illinois

You Don't Need a Toolmaker

TO RUN AN O-8 MILLER



Above: Boss of the feed cycles. Cycle selectors may be changed in a minute or two



CINCINNATI No. O-8 Plain Automatic Milling Machine with automatic rise and fall spindle carrier

WHEN you find it difficult to hire toolmakers and first class machine operators, then you appreciate machine tools having that intangible quality "built in skill", coupled with as many automatic features as compatible with your production requirements. These two factors—both of which are prominent in CINCINNATI O-8 Millers—go a long way towards keeping your assembly line running smoothly.

In the illustration above, the operator is milling slots in adding machine type. After loading the magazine holding device (it accommodates 20 parts) and clamping the fixture, there's only one thing for her to do—flip the cycle starting lever. The machine automatically goes through the cutting cycle, returning the table to the starting point.

The complete cycle requires only .67 minutes, production depending largely upon the rapidity of unloading and loading the magazine. And—accuracy within .001" is easily maintained.

This machine is not a single purpose installation — far from it. By merely changing the cycle selector (a matter of a minute or two), almost any conceivable feed cycle can be obtained.

Write for catalog M-828. It contains complete description and specifications for CINCINNATI No. O-8 Plain Automatic Milling Machines.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . DIE SINKING MACHINES

Production Perspectives

News of Mass Manufacturing Everywhere

MACHINE tool shipments for June increased to $63,400,000 as compared to $60,800,000 for May of this year and $34,000,000 for June, 1940. The entire production of the industry is going to national defense and aid to Britain. The industry has practically doubled its rate of production within the last twelve months. Shipments are expected to continue to mount steadily and according to present indications, the industry will meet or exceed its announced goal of a total production of $750,000,000 during the year 1941.

A huge six-lobed barrage balloon on June 23 soared thousands of feet into the air over Wingfoot Lake, near Akron, Ohio, higher by three times than anything yet developed by the British, according to Goodyear Tire & Rubber Co. experts who devised it. Goodyear experts claim the balloon, which carries 68,000 cubic feet of helium, will attain an altitude of 15,000 feet, while the maximum reached by the barrage balloons over London is around 5000 feet. The new balloon, called the "Strato-Sentinel," weighs about 1000 pounds when deflated and can be rolled up and carried on a truck.

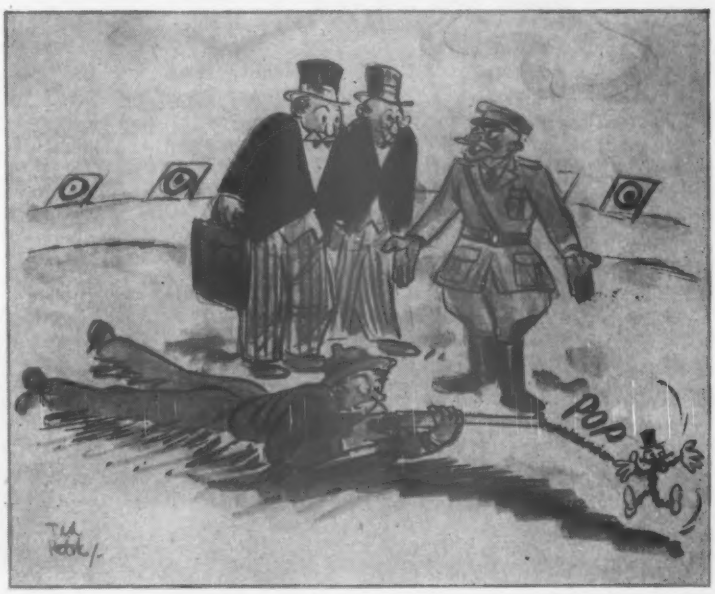
American arms production has leaped to record proportions, defense officials disclosed July 9 at Washington with announcements that aircraft output has reached an all-time high and that shipbuilders will be turning out 100 destroyers a year by the end of 1943. The Office of Production Management revealed that the June production and delivery of airplanes for the Army, Navy and Great Britain amounted to 1476, despite the strike at the Inglewood, Cal., plant of North American Aviation, Inc. The figure is 142 higher than May production. At the same time, Rear Admiral S. M. Robinson, chief of the Navy's Bureau of Ships, told the Senate Defense Investigating Committee that warship construction has "exceeded all expectations." The output of small vessels is proceeding "at a very rapid rate," Robinson said. "At the end of 1943, we will be completing destroyers at the rate of 100 a year," he testified. Officials estimated that the North American strike resulted in the loss of 70 planes, which would have brought total June deliveries to about 1550.

The southern California aircraft industry on July 11 revealed production of war planes has reached an all-time high and that the planes rolling off the assembly lines are equal or superior to any in the European skies. The huge Douglas Aircraft Co. disclosed that its dive bombers out-perform any aircraft of a similar type engaged in actual combat in the Nazi drive against Russia. These planes are in quantity production now. Lockheed Aircraft Co. reported that during the first half of 1941 it reached its highest level of production. Lockheed is turning out an immense quantity of Hudson bombers for Britain and the P-38 interceptors for both the United States Air Corps and the British. The official statement, as released by the War Department, said: "The War Department announced today that initial deliveries of the A-24, the army's new dive bomber, have been received by the air corps. Preliminary tests indicate that the new bomber will outperform dive bombers now in use by foreign nations . . ."

National Industrial Conference Board reports cost of living in June was 1.3 per cent higher than in May and 3.5 per cent above June, 1940. Board estimated food prices were 4 per cent higher than in May and 8.1 per cent over June last year. June rents increased .2 per cent compared with May and 1.6 per cent in relation to June, 1940.

Capt. P. C. Wooters, proof officer at Erie Proving Grounds near Port Clinton, Ohio, blew his whistle twice July 15. The second blast was followed immediately by a resounding boom which marked the first of a number of things. The first shot was fired out of the 75 mm. cannon mounted on the first production-line medium tank which was to be turned over to the troops within the next few days after its four machine guns and two cannons are proof-tested. The heavily armored machine, designated by the army as an M-3, is a 28-ton, medium tank which is reputed to have a speed of approximately 25 miles an hour over level country. Capt. Wooters explained that in the case of the 75 mm. cannon, the first two shots fired were with shells containing but 50 per cent normal charge. Then a normal charge is used, followed by two overcharges of 110 and 115 per cent. Several more shots are fired at various elevations and at extreme right and left traverse. While this testing is taking place, two radio-equipped speedboats patrol the restricted waters of Lake Erie off the grounds to warn away unwary boats. At the same time a huge 15-foot red pennant is flown from the top of a huge water tower to warn all that tests are being fired. Lieut. Col. T. K. Vincent, commanding officer at Erie Proving Grounds,

INDUSTRIAL MOBILIZATION



Drawn for THE TOOL ENGINEER by Ted Petok

"Didn't I tell you not to let that novelty company manufacture guns!"

said he expected to be testing tanks every day and that more than one would be tested daily.

BOTH dollar value and physical volume of manufacturers' inventories currently are the highest on record, the Department of Commerce reported at Washington on July 15. The department estimated that inventory holdings have been increased by about $1,500,000,000 since the defense program was started in May, 1940.

The Office of Production Management on July 18 issued an order regulating the use and distribution of cutting tools and providing that defense industries be given preference. E. R. Stettinius, Jr., defense director of priorities, said that "there is an increasing shortage of cutting tools which are vitally needed in defense plants and supervision over the distribution of these tools is necessary." The order provides that no manufacturer or distributor may deliver cutting tools except to those customers who have a defense preference rating.

Here's one of the toughest **Munitions Broaching Jobs** *Made Easier with* **Stuart's Thred Kut**

PAT'D U. S. PATENT OFFICE

90 mm. Anti-Aircraft Breech Ring

● Above is shown the set of 14 broaches used to broach the 90 mm. anti-aircraft gun breech ring. 28 cuts are taken to remove 230 cubic inches of material. One part of the square hole has a 1¼° taper. Squareness, size and taper are held to an accuracy of .0015".

THIS is another example of a difficult metal working problem made easier with Stuart's Thred-Kut. These 1,000 lb. breech rings are broached on the largest broaching set-up ever developed by Lapoint Machine Tool Co. It was natural to put Stuart's Thred-Kut on the job because of its proved performance and wide use in armories, arsenals, aircraft plants and other related industries where *nothing less than the best* cutting fluid can serve.

For tapping, threading, deep drilling, broaching, gear cutting and all alloy steel machining operations — use Stuart's Thred-Kut! You'll save time, money and headaches. Write . . . wire . . . phone for a trial drum today.

REMEMBER: the cost of cutting fluids is measured by pennies—the cost of tools and production by dollars!

For All Cutting Fluid Problems

D. A. STUART OIL CO.

Chicago, U.S.A. • LIMITED • Est. 1865

Warehouses in All Principal Metal Working Centers

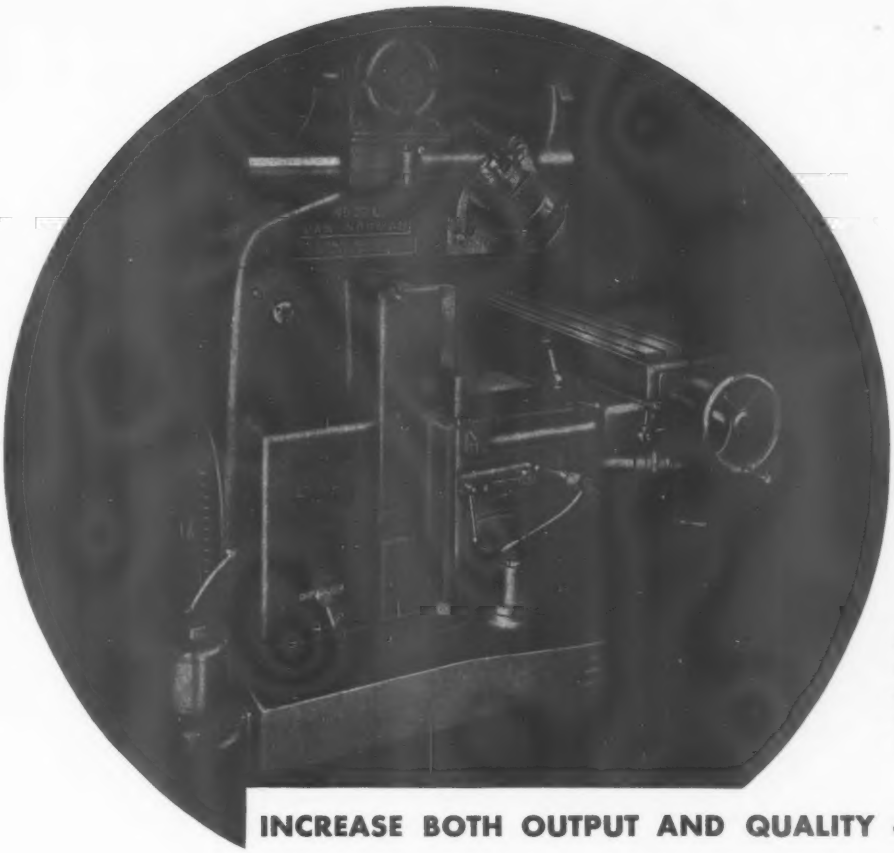
Employment of 60 sub-contractors has relieved a critical shortage of machines for producing small arms ammunition, and will put mass production of this material approximately six months ahead of schedule, officials revealed June 26 at Washington. In 1939 only one company produced the machinery needed for making ammunition. Soon, it was glutted with defense orders. Finally the company's engineering staff and War Department experts arranged with 60 small concerns to handle about $4,000,000 of the machinery orders with the result that all are being completed months ahead of schedule. The equipment will be placed in the Army's six plants being built to produce the cartridges with the result that the first three will be finished by September 30, many months ahead of schedule.

National income in the United States for the first five months this year rose to the highest level for any corresponding period on record and present indications are that total for 1941 will be the largest annual figure in history, the Alexander Hamilton Institute, Inc., reported July 21 at New York. The institute estimated national income for the five-month period at $35,450,000,000, an increase of 23.9 per cent over the corresponding 1940 period's total of $28,604,000,000, and compared with $33,876,000,000 in same period of the predepression year, 1929.

An Army and Navy Munitions Board survey revealed at Washington on July 9 that more than 1,000,000 defense contracts had been approved. The Office of Emergency Management said that the value of the contracts totaled $20,960,000,000.

Warner & Swasey Co., Cleveland, announced July 21 that all shop employees had been paid a bonus of one week's wages on July 17.

EMPLOYMENT in 25 metal working industries in Western Massachusetts which furnish the figures for the labor barometer of the metal trades association was 1,230 jobs greater June 1 than May 1 and the total of 28,302 individual workers was far and away the largest ever recorded by the association. The May gain continued the trend since the first of the year as an increase of 1,000 jobs has been shown each month since then. The 25 concerns are all in private industry and do not include the 6,700 persons currently working at the U. S. Armory in this city, which qualifies as the largest metal working plant in this part of the state.



No. 22-L

PLAIN & UNIVERSAL:
Table: 45" x 10".
Range: 26" longitudinal, 11" cross, 16" vertical.

INCREASE BOTH OUTPUT AND QUALITY on toolroom, contract, pattern, experimental and small-lot production work . . . with Van Norman Ram Type Universal Millers. The adjustments of swiveling cutterhead and sliding ram make it easy and convenient to mill vertical, horizontal, and angular surfaces...without attachments and with fewest reset-ups. There are many other important features: New streamlined column . . . directional front and rear controls of power feeds . . . 6-way rapid traverse for the new and improved table, knee and saddle . . . large dials . . . wide speed and feed selection . . . and greater rigidity. For a full picture of all the details provided in the new models of Van Norman Ram Type Universal Millers . . . write for illustrated bulletins.

VAN NORMAN MACHINE TOOL CO., SPRINGFIELD, MASS.

Toronto - - -

Toronto Convention and Tourist Association

- - - Scene of Fall Meeting

WHAT will be to most A.S.T.Eers a "big treat" is the coming Semi-Annual meeting of the American Society of Tool Engineers, scheduled for Toronto, October 16, 17 and 18. Toronto is a beautiful city which has every convenience to give the A.S.T.E. a good time, and in a land actually at war, yet so much like our own that we will feel completely at home, yet so different that its novelty and interest is bound to give this gathering of Tool Engineers a very special flavor.

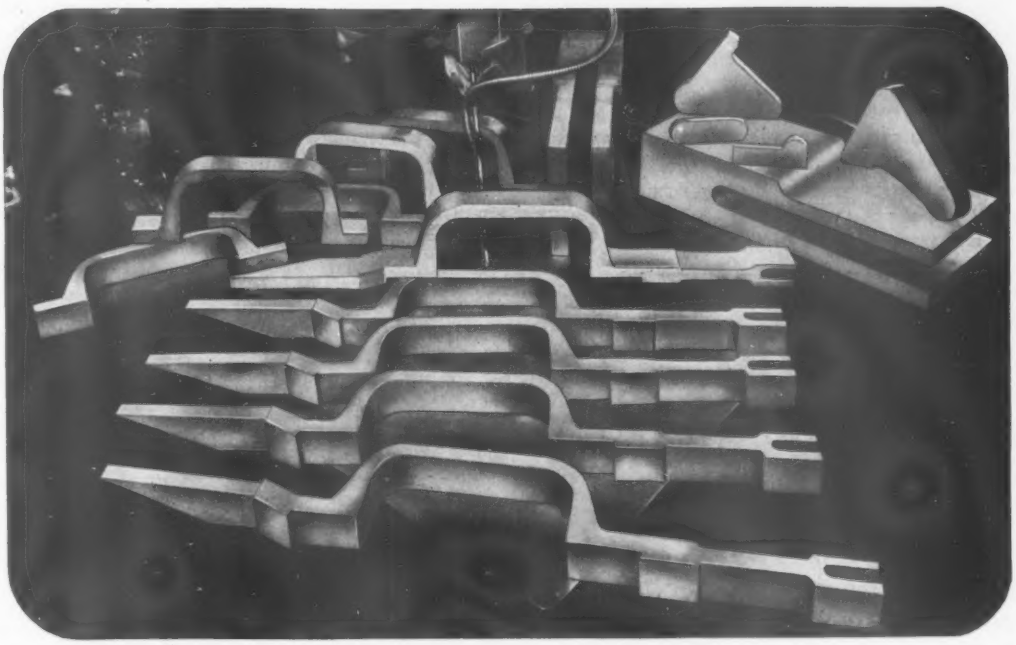
Canadian Tool Engineers have been extremely busy the past several weeks arranging many plant tours in some of Canada's most important arms producing plants, and the Canadian Government at Ottawa is cooperating to the fullest extent in urging plant managers to extend every cooperation to the visiting Tool Engineers from the States. Ample entertainment facilities are being provided by the Canadian Tool Engineers and an invitation is being sent to the Governor General to attend as guest of honor at the banquet. A special post convention hunting trip is being planned for Tool Engineers who are ardent fans of gun and rod to enjoy some of the finest hunting and fishing that the Dominion offers — after the convention period. Most important of all, some of the most outstanding technical speakers obtainable are scheduled to address the various technical sessions and "arms production" will be discussed at length so that every Tool Engineer should come away with a greatly augmented knowledge of what Canada is doing and what is expected of Tool Engineers on this Continent.

The Royal York Hotel in Toronto has been selected as A.S.T.E. headquarters. It is the largest hotel in the British Empire, having twelve hundred rooms and modern in all respects. This hotel has been the scene of many of the largest trade association conventions on this continent and has very adequate accommodations for the convention sessions, and social events, all on one floor so that there will be no division of interest on different floors of the hotel.

No Border Difficulties

No one need worry about encountering any difficulties in crossing the Canadian border, even though Canada is at war. No passports are required for permanent residents of the United States to enter Canada as tourists or to attend conventions. There are no head taxes or entry permit fees of any kind. The United States Department of Immigration is not making it difficult for American citizens to return home from Canada. As a matter of convenience, every one should carry something with which to identify himself. The United States Immigration Officers very frequently do not ask for any documents at all. When they do ask for identification, almost anything that one happens to have in his pocket will do. For example: a tax receipt, a motor vehicle driver's license, club membership cards, etc., etc. Some people take the precaution to secure a letter of identification from their bank or some municipal officer before leaving home, but that is seldom if ever necessary. Of course, if one happens to have a birth certificate handy, that is a very wise thing to have along. Naturalized citizens should carry their naturalization certificate with them, and legal residents of the United States who

DoAll SAVED $600 ON THIS ONE JOB!



Taylor-Wilson Mfg. Co., McKees Rocks, Pa. had an important defense contract calling for forgings for large parts in the foreground. Dies would have cost lots of money. Making them by hand would have been slow and very expensive. The DoAll made the parts in 16 hours and this firm calculates that the saving was $600.

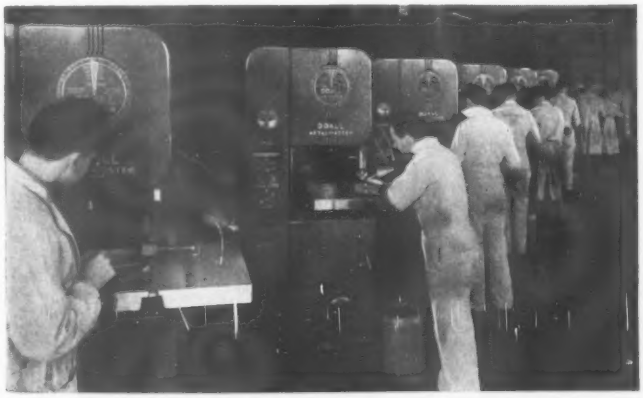
TODAY'S MIGHTY PRODUCTION TOOL

★ **When Precision Cutting is Essential**

★ **When SPEED is a Big Factor**

DO-ALL Contour Machine BAND SAWING BAND FILING BAND POLISHING

DoAll is doing First Aid service in large and small plants wherever metal is cut—to make molds, dies and special tools—on the production line in motor and aeroplane factories, arsenals, ship yards, etc. Takes the place of shaper, milling and lathe work.



A line of DoAlls in use at Canadian Fairchild Aircraft, Limited, Montreal, Que.

• IMMEDIATE DELIVERY

Every 40 minutes a DoAll comes off our assembly line. We are keeping up with the demand for these indispensable machine tools. All orders are given prompt attention.

Let one of our trained men come to your plant and show you how the DoAll can cut time and costs for you.

FREE—Literature and 158-page Handbook on Contour Machining.

CONTINENTAL MACHINES, INC.

1304 S. Washington Ave. Minneapolis, Minn.

Associated with the DOALL COMPANY, Des Plaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.

are not United States citizens, should secure re-entry permits before leaving the United States.

Necessary formalities at the border take but a few minutes. Tourists report to the Canadian Customs Officers at the port of entry, and if travelling by train, answer one or two questions as to where they are going and for what purpose. If travelling by automobile, arrangements are made for the passage of the car back across the border at the end of the journey. While it is not possible to drive a motor car into Canada for business purposes, that does not affect those driving in to attend the convention. They enter the same as tourists. All personal effects cross the border without any question whatsoever. If you are going hunting after the convention, you can take your dog, but you must secure a special permit to take in your hunting rifle. Fifty cigars, two hundred cigarettes and two pounds of tobacco in open packages may be taken across the border without duty.

United States money commands a premium in Canada, and the Foreign Exchange Control Board of that country, has made it obligatory for Canadians accepting United States currency in payment for goods and services, to allow the legal premium (10 per cent at present).

There is no need to worry about differences of clothing that would be required for a convention in Canada in October. Normally the seasonal temperatures in Toronto do not vary greatly from those of New York or Chicago. At the worst a difference of ten days or two weeks might be allowed.

The September and October issues of this journal will carry more complete details on what Canadian Plants are to be visited, technical sessions, subjects to be covered, the speakers, program and other information of interest.

This is one convention of A.S.T.E. that we are going to attend—it is our one chance to go "abroad" without any inconvenience and with all the fun. We will be "seeing you."

Get Better Response with Ryerson V.D. Steel

Better Dies, Punches, Chisels . . . Easier Machining . . . Easier to Harden . . . Less Expensive

Ryerson V.D. Steel solves a threefold production problem in tool-making .... quality steel; ease of machining; low cost. Splendid water-hardening results are always assured, because V.D. Steel offers the widest range of hardening temperatures of any steel in its group. It takes no tricky methods to produce excellent work. Even heating beyond the usual hardening range has no effect on its fine grain structure.

Many successful shops find it profitable to standardize on Ryerson V.D. Steel as their only water-hardening steel. Its treatment is so simple that experience gained from heat treatment can serve for all future applications. Learn more about this remarkable, low cost V.D. Steel today by sending for a descriptive bulletin.

Send the coupon or write Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Boston, Buffalo, Philadelphia, Jersey City.

RYERSON STOCKS INCLUDE:

Structurals	Tool Steel	Strip Steel
Bars	Shafting	Welding Rod
Plates	Screw Steel	Babbitt, Solder
Sheets	Tubing	Nuts, Bolts
Alloys	Stainless	Rivets, etc.

SEND FOR BULLETIN—ADDRESS LISTED ABOVE

Name .....
Company .....
Street .....
City .....
State .....
Position .....

RYERSON CERTIFIED STEELS

Changes Won't Affect Car Quality

There will be no reduction in the quality of cars built by the Ford Motor Company, regardless of changes in specifications made necessary by restriction in the use of certain metals essential to the defense program, according to R. H. McCarroll, Ford metallurgist.

Probabilities are that the weight of the cars will be increased slightly but this increase will not be large enough to affect gasoline economy. The increase in weight will be less than five pounds in the case of the Ford and Mercury cars and not more than 20 pounds in the Lincoln cars.

The only other effect of the changed design will be that the cars will cost somewhat more to produce. The carburetor bowl, for example, is now a zinc die casting and will be changed to cast iron. While zinc is a good deal more expensive than iron, the iron carburetor bowl will cost more than the zinc because more machining will be required.

"The owner would never know the difference as far as the performance and operation of his car are concerned," McCarroll said.

Recent Innovations in

Salt Bath Furnace

Practice

Earlier limitations on the salt bath furnace process have been removed and engineers find increasing applications.

By WILLIAM ADAM, JR.

The use of salt baths for heat treating purposes is quite old—probably fifty years old. In its simplest and earliest form, known as a pot type furnace, it was heated by gas or oil. The pot containing the salt is placed within a combustion chamber, and the heat, absorbed by the pot, is conveyed to the liquid salt. In this type of externally heated furnace, a large temperature gradient must be maintained between the combustion chamber and the salt bath in order to force the heat through the pot wall. For example, to maintain an adequate heat flow to a bath operating at 1500 deg. F. the combustion chamber temperature is usually kept above 2000 deg. F. The thermal efficiency of this type furnace must obviously be very low. Under actual production conditions it rarely exceeds 6 per cent.

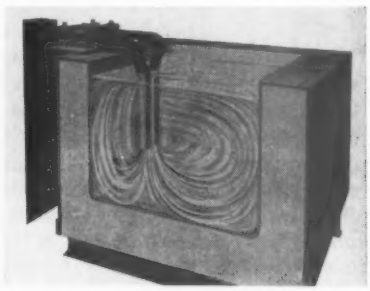
While there are many disadvantages in operating such fuel-fired furnaces, the most serious one is the exorbitant pot maintenance cost. The life of a cast steel pot, used with a bath operating from 1500 to 1600 deg. F., may vary from a few hours to 1500 hours. The short life is due chiefly to the corrosive effect of the flames on the outside of the pot. This factor, coupled with the poor operating efficiency and atrocious working conditions caused by the excessive radiated heat, has limited the use of fuel-fired pot furnaces, for temperatures above 1200 deg. F., to rather small units. Nevertheless, there are many thousands of these small salt baths in service today, and the fact that they are tolerated at all speaks volumes for the metallurgical results that can be obtained from them compared with other heating media.

Attempts have been made to utilize the conventional electric heating element in these pot type furnaces. Nickel-chromium heating elements mounted on the walls of the furnace radiate their heat to the outside surface of the pot. As is well known, such metallic heating elements cannot be operated continuously above 1900 deg. F., which does not afford sufficient temperature head to operate a bath above 1500 deg. F. When a cold charge is immersed in the bath, it chills the salt very appreciably and with a limited temperature available in the heating chamber, the bath recovers its temperature much too slowly after the work is immersed. Furthermore, certain salt fumes, such as sodium cyanide, result in rapid deterioration of the heating elements and they are quite costly to replace.

Salt Bath Furnaces in Automobile Plant
Clutch plates used in automatic transmissions are hardened.

For these reasons, and other limitations, this type of externally heated electric salt bath furnace has never gained commercial prominence.

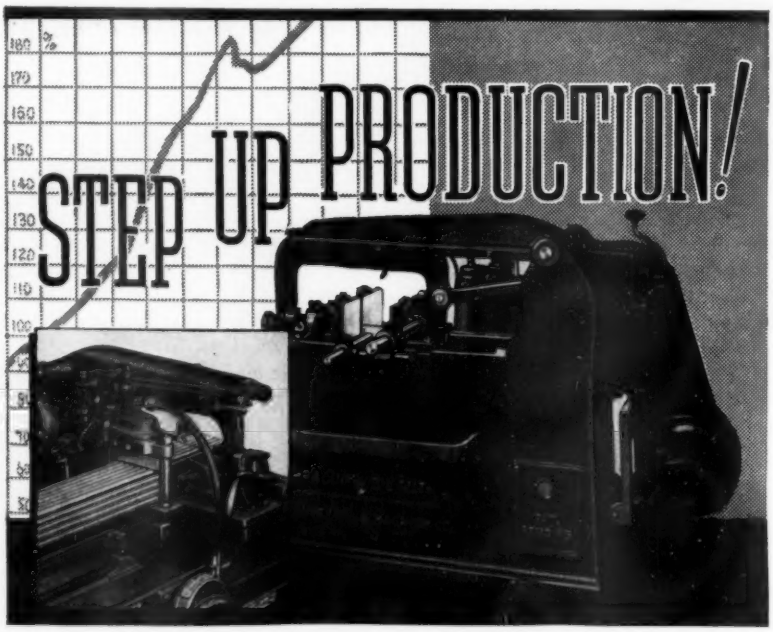
As far back as 1906, attempts were made to overcome the shortcomings of externally fired salt baths by generating heat electrically within the bath itself. All salts, while good insulators in the solid state, become fairly good conductors when melted. This electrical characteristic was used by a European furnace designer and resulted in the first immersed electrode type furnace about 35 years ago. The electrodes were arranged on opposite sides of a refractory pot and a low voltage applied to their exposed ends. Current then traversed the liquid bath between these electrodes, and heat was generated by virtue of the resistance of molten salt to the flow of current. A fairly uniform temperature resulted throughout the contents of the pot, even when operated as high as 2350 deg. F. for hardening high speed steel tools. Unfortunately, this condition became seriously disturbed when the work to be treated was immersed in the bath. Steel, of course, is always a much better conductor of electricity than molten salt, and in a furnace of this type, where the current passed through the region of the bath in which the work was immersed, local overheating resulted due to the current crowding into the steel. In fact, the current concentration became so great in work having unequal sections, such as a threading chaser, that portions of it melted although the temperature of the bath itself was unaltered. This furnace has found a limited use in Europe, but several attempts to introduce it in this country have met with no success. In addition to the danger of overheating the work, it presented serious difficulties in melting the solidified bath because the widely spaced electrodes make it hard to create and maintain a pool of conducting liquid salt between them.



Effect of Electro-Magnetic Forces
A vigorous circulation throughout the bath.

Hultgren Process

It remained for Hultgren, a prominent Swedish metallurgist, to point the way of avoiding the danger of local overheating in the work, and, at the same time, retain the simplicity and inherent metallurgical advantages of the immersed electrode type salt bath furnace. We will describe this furnace development, known in this country as the Ajax-Hultgren Salt Bath Furnace, and give some data pertaining to the heat treating operations to which it has been applied. That it has found widespread application since its introduction in 1936, is indicated by the fact that over 400 installations have been made with a total connected load of approximately 25,000 K. W.



THESE RACINE ..... OIL-CUT MACHINES

will cut cold rolled bars at the rate of 5 to 6 square inches per minute. 3-inch steel tube with ¼" wall is cut in 30 seconds. 3-inch round cold rolled SAE 1020 is cut in 1 minute 30 seconds. 6-inch round in 5 to 6 minutes.

This latest development in metal cutting machines embodies the advantageous features of hydraulic feed and control. It carries all the fool-proof and enduring qualities inherent in properly designed, oil operated and oil lubricated mechanisms.

Single lever control . . . Oil cushion operation . . . Self-compensating, flexible hydraulic feed . . . remarkable cutting accuracy . . . a life-time machine.

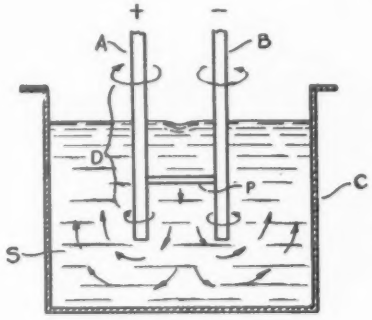
Most complete line—saws for every purpose 6 x 6" up to 14 x 20" capacity. General purpose, production, fully automatic types, literature upon request.

Write for Catalog No. 60

RACINE TOOL AND MACHINE COMPANY
1777 STATE ST., RACINE, WISCONSIN

SALT BATH

Any ordinary shop voltage such as 220, 440, or 550 volts, is impressed on the primary of a step-down transformer, the secondary of which provides a low voltage directly connected to the terminals of the electrodes. A group of electrodes, usually a pair, are immersed in the salt, which, being melted, is an electrical conductor. These electrodes are closely spaced, leaving a gap of only 1 to 2 inches between them. A low voltage, from 5 to 25 volts, is impressed across the electrodes, and alternating current then flows through the liquid salt lying in the gap between the electrodes, which heats the salt by virtue of its own resistance to this flow of current. The groups of electrodes are arranged in close proximity along one side of the bath, so that the heating zone is kept separate and distinct from the working space. The close electrode spacing makes it possible to utilize the electromagnetic forces at the electrodes to produce a vigorous circulation throughout the bath, (Figure 1). This electromagnetic circulation causes the liquid salt to be drawn into the gap between the electrodes and sucked downwardly. To maintain equilibrium in the bath there is an upward flow at the sides of the pot to replace the



The Electrode System
The theory is explained.

liquid forced down from the top. This circulation literally takes the heat away as fast as it is generated between the electrodes and assures uniform temperatures throughout the bath.

Figure 2 explains the theory of this electromagnetic circulation. Any conductor which carries current, when placed in a magnetic field, tends to move at right angles to the direction of the magnetic field and at right angles to the direction of the current. Applying this rule to the salt bath, by

SIGNALS

"Everything under control"

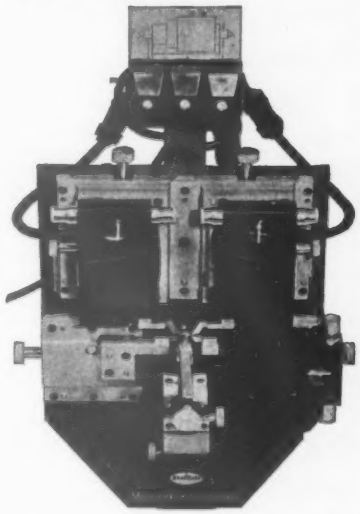
The Multichek Electrigage is like a battalion of U. S. troops. They quickly establish order and have everything under control. The Multichek Electrigages check a number of dimensions on a work part simultaneously, flashing the answers on a control panel.

This panel carries an elevation drawing of the work piece with each critical dimension shown. A signal light is provided for each of these dimensions.

A signal light showing red indicates its dimension is undersize, green an oversize dimension and amber that the dimension is truly within tolerance limits. When four or more measurements are being checked a master signal may be provided at the top of the panel to show white when all dimensions are correct. Thus the inspector looks only at the master signal unless it indicates trouble somewhere below.

Other models of this instrument are just as effective on extremely large shell bodies as this model is on small pinions less than a quarter of an inch long. Every part produced in large quantities which has several dimensions to be checked should be inspected on the Multichek Electrigage regardless of bulk.

Write for details



THE SHEFFIELD CORPORATION
Gage Division · DAYTON, OHIO, U.S.A.
SHEFFIELD MASTER GAGEMAKERS

way of explanation, electrodes A and B are immersed vertically and close together in a molten salt "S" held in the vessel "C", and a current of high magnitude, 3000 amperes for example, is passed between them. Each electrode is surrounded by approximately circular lines of force "D". Current of uniform density flows between the electrodes at all points from the surface of the liquid to their ends. If a current element "P" is taken midway between the two electrodes, and some distance down from the surface, and the current is travelling at any instant from "A" to "B", then with the resultant electromagnetic field between the two electrodes extending outward from the plane of the figure at the point "P", the conductor, or element of the liquid salt which is carrying the current, will be forced downward between the electrodes in the direction of the arrow. If the direction of the current is reversed, the direction of the magnetic field automatically reverses, and the direction of movement is still downward.

The force of the circulation is greatest where the electrodes emerge at the surface of the bath, and falls off gradually as the depth increases and as the end of the electrode system is approached. This follows from the fact that all the current is flowing in the electrodes at the upper end, but less and less flows in them at lower points. Hence, the field of force "D", as shown, is many times stronger at the top then at the bottom. In addition to the forces just described, there are some other minor electromagnetic forces, such as pinch effect, repulsion and crowding effects, which assist and contribute to downward flow.

For baths requiring a large power input, polyphase currents are used. In this case, electrodes in groups of three are employed, but the electromagnetic circulation is essentially the same as in the case of the single phase arrangement using a pair of electrodes.

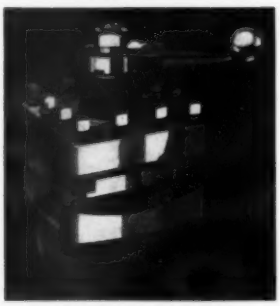
Automatic temperature control is provided by means of the usual train of apparatus; i. e., thermocouple, pyrometer controller and magnetic contactor. The thermocouple, protected by a metal sheath, is immersed in the bath.

Now, let us examine some of the results obtained with this type salt bath furnace in commercial practice. I shall confine this to the more common heat treatments, such as cyanide hardening, carburizing, neutral hardening of carbon steels and high speed steel tools, age hardening and tempering, annealing, brazing, selective heating, and forging.

Cyanide Hardening

More salt bath furnaces, both fuel-fired and electric, are used for hardening finished carbon and alloy steel parts in sodium cyanide baths than for any other heat treating operation. As an illustration, over 75 per cent of all automotive transmission gears are cyanide hardened today. It is generally considered the ideal heating medium for hardening finished machined work, because it not only prevents any decarburization but produces a file-hard wearing surface or case. Straight sodium cyanide baths, containing from 5 to 30 per cent of sodium cyanide, and operated at tem-

CUT OUT TIME-OUT
for changing lathe tools



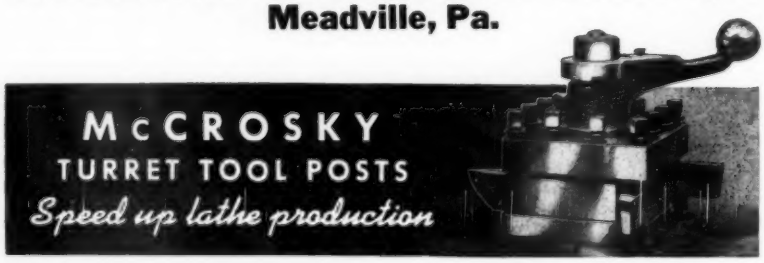
McCROSKY STLYE L
4-WAY TURRET

McCROSKY STYLE R
HEXAGON TURRET

Ask for
McCROSKY
COST CUTTING TOOLS
BULLETIN
No. 15-E

IF you are planning to use an engine lathe for a production job requiring two or more operations, investigate the time-saving advantages of equipping the lathe with a McCrosky Turret. It will enable the operator to set up all tools before he starts production. As each successive tool is needed, he can index it quickly and accurately into position without stopping his machine,—all McCrosky Turrets have 12 indexing positions .... Made in 6 styles and many sizes, all ruggedly built to stand up under high production pressure.

McCROSKY TOOL CORPORATION
Meadville, Pa.



Single Point and Multiple Point

DIA-TOOL INC.

Diamond Wheel Dressers

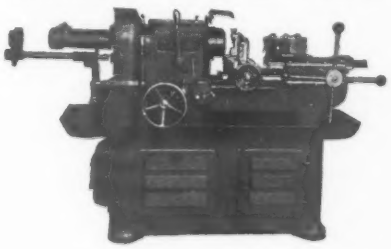
Set in sintered Tungsten Carbide

Write for Literature DIA-TOOL INC., 320 YONKERS AVE., YONKERS, N. Y.

MOREY No. 2G & No. 3 Turret Lathes

Motor Drive

INFINITE SPINDLE SPEEDS



	No. 2G	No. 3
SPEEDS from	90 to 1800 R.P.M. or 180 to 3600 R.P.M.	60 to 2100 R.P.M. or 100 to 3600 R.P.M.
CAPACITY	1" x 6½" turning length	1½" x 9" turning length
	Ask for Bulletin No. 629	*Ask for Bulletin No. 727*

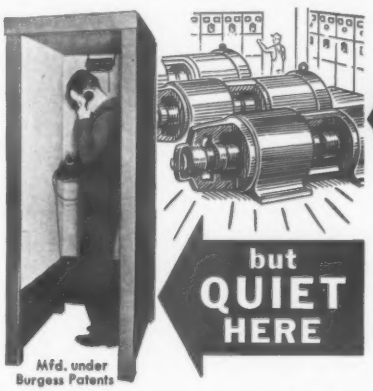
Any spindle speed you want—a direct reading dial shows when you've got it.

Permits the use of carbide tools for fast cutting.

Turret clamps and unclamps automatically.

Equally effective on second operation and chucking work.

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.



It's Easy to Telephone— This Acousti-Booth Keeps OUT Noise

You'll be surprised at the "Zone of Quiet" in the Burgess Acousti-Booth. Put your shop phone in one of these acoustically lined booths. You'll be able to hear clearly without confusion. The patented, sound-absorbing walls blot up factory noise and keep your voice inside. No doors are needed.

There are no mechanical parts—hence no maintenance is required. Open construction makes it easy to use and keep clean. Send coupon for illustrated bulletin and prices.

Mail Coupon for Free Booklet

Burgess Battery Co., Acoustic Div., 558 W. Huron St., Chicago
Please send illustrated catalog describing the Burgess Doorless Acousti-Booth and how it works.

Name _____

Firm Name _____

Street-City _____

BURGESS ACOUSTI-BOOTH

peratures from 1450 to 1650 F., will produce a case depth up to .010 in. It was in this field of work that the Ajax-Hultgren Furnace made its debut. A careful investigation of the performance of gas and oil fired cyanide furnaces showed that they rarely operated with a thermal efficiency of more than 6 per cent, and cast steel pots had a life of only one to six weeks. The internal heating principle of the electrode type furnace seemed ideally adapted to compete with this fuel-fired equipment on a direct operating cost basis, without resorting to the more intangible arguments for electric heat, such as better temperature control, improved working conditions, etc. Experience quickly justified the wisdom of selecting the field of cyanide hardening as an entering wedge for the electrode type furnace. Over 150 installations in this field have shown that power costs are no more than fuel in furnaces using natural gas and considerably less compared with city gas. It is merely a matter of comparing thermal efficiencies of about 65 per cent in the electrode type furnace with 4 to 7 per cent in fuel-fired equipment.

What seemed to surprise the industry most, however, was the simple solution of the pot problem. We use plain, welded steel boiler plate pots, and several installations have been in continuous operation for three years. The average life, however, is more nearly 18 months, or about twelve times the pot life that can be expected from gas fired pot furnaces under similar conditions.

SPEED CASE STEEL
A LOW CARBON OPEN HEARTH PRODUCT
Assures You...
1. SMALLER INVENTORY
Because it machines like Bessemer, carburizes like SAE X1020 or X1314, has physicals like X1020-X1314 and exceptional ductility it will replace these grades you stock.
2. INCREASED PRODUCTION
40% to 80% Over SAE X1020-X1314, etc.
3. MACHINABILITY
Machines as fast as SAE X1112
4. CARBURIZING
Carburizes like SAE X1020
5. PHYSICAL PROPERTIES
Equal to SAE X1020-X1315-1115
6. UNUSUAL DUCTILITY
180° Bend (Cold Drawn - 1" Rd)
JOBBERS NOTE!
Reduce Your Inventory
SPEED CASE
the ALL PURPOSE Steel
will allow you to reduce the number of different steels you are now carrying in your stock.
ASK US FOR DETAILS

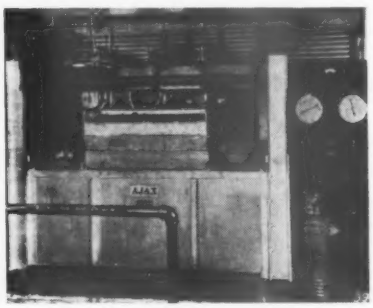
Licensor
MONARCH STEEL COMPANY
HAMMOND • INDIANAPOLIS • CHICAGO
PECKOVER'S LTD., Toronto, Canadian Distributor

Licensee for Eastern States
THE FITZSIMONS COMPANY
YOUNGSTOWN, OHIO

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

Carburizing

As a result of the "activated" cyanide baths developed by leading salt manufacturers during the past seven years, it is now possible to produce case depths in the electrode type furnace up to .125 in. This may seem like an exaggerated claim, when it is considered that you will find nothing in the literature or even the propaganda of liquid carburizer catalogs contending that case depths greater than .050 in. are possible by the salt bath method. But something of a rather startling nature has happened in the past few months, the impetus of which came from our present military defense program. I am sorry that I am not at liberty to go into details, but there are several salt bath furnaces now in commercial operation producing light armor plate, with a carburized surface up to ⅛ in. in thickness.



Carburizing Gears

Work charged at one end is supported from overhead screw which conveys gears through bath on definite time cycle.

Commercial work, rarely calls for carburizing steel parts to a greater depth than .040 in. It is often claimed that liquid carburizing is faster than other carburizing methods, such as

ANNOUNCING THE ACCURATE NEW

UNIVERSAL CENTERING CHUCK...

The new Universal centering chuck converts a drill press into a centering machine. Furnished with a set of bushings and collets for various size center drilling. Accurate and sturdy. Depth adjustment for centers. Write for catalog and prices.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH · MICHIGAN

Ames
GAUGE No. 2

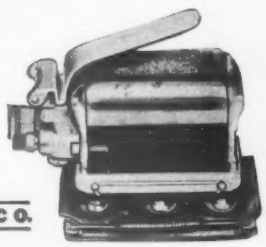
For measuring in thousandths inches. Lever lifts spindle to measure materials up to 3/10 inches. Adjustable anvil, 2" in diameter. Height 5 inches. Price $22.50.

B. C. AMES CO. *Waltham, Mass.*

LET "SANDY" STRETCH OUT YOUR MAN POWER!

DEFENSE WORK is demanding more and more manpower. Today's scarcity of good workmen means that management must find ways to **stretch out manpower** to fulfill the crying need for speed, and prevent rising production costs.

"SANDY" speeds up slow, tedious hand-sanding . . . does it **three times faster** . . . gives you a **perfect** surface. One worker, with "SANDY", can do as much work as three old-fashioned hand-sanders. Call on Sterling Engineers to help you stretch out your manpower. Send coupon to us TODAY!



Sterling
TOOL PRODUCTS CO.
363 E. OHIO ST. • CHICAGO

"I'LL GIVE YE FREE INFORMATION ON HOW TO SAVE MONEY ON SANDING"
STERLING TOOL PRODUCTS CO. (E-3)
363 E. OHIO STREET
CHICAGO, ILL.

☐ Please send FREE booklet — "Hints on Sanding Savings".
☐ Please have Sterling Engineer call as soon as possible.

NAME.....
COMPANY.....
ADDRESS.....
CITY.....STATE.....

pack or gas carburizing. I don't think this is strictly true. Much evidence points to the fact that any of the carburizing methods, when performed in a properly designed furnace, will produce a given case depth in about the same time. However, it is quite obvious that work immersed in a liquid bath will reach the carburizing temperature of 1600 to 1750 F. much faster than in a furnace where the heating-up rate is dependent upon radiant heat.

This time saving factor becomes more important the shorter the carburizing cycle. Thus if we consider the case where two hours are required to produce the desired case depth, and it takes only 10 minutes to bring the work to temperature in the salt bath compared with one hour by another method, then there is a net gain of 50 minutes per charge in favor of the liquid carburizing method. Instead of a long cooling cycle as used in pack carburizing followed by a reheat for hardening, the work is quenched directly from the liquid bath. This speeds up the process still further and eliminates the cost of reheating entirely.

There is a noticeable difference in the character of the case produced by an activated cyanide bath compared with other carburizing methods. The active element in the bath is sodium cyanide (NaCN) which is first oxidized by its contact with air to produce sodium cyanate (NaCNO). When this cyanate decomposes, carbon monoxide (CO) and nascent nitrogen (N) are evolved. The carbon monoxide transfers carbon to the steel surface, and the nascent nitrogen is absorbed to form the characteristic hard iron nitrides. This nitriding element, present in liquid carburizing, is not present in other carburizing processes.

Neutral Hardening

About the most exacting heat treating operation encountered in industry is the hardening of high speed steel tools. All we are asked to do is to heat the steel right up to the point of incipient fusion, 2200 to 2400 deg. F., and retain a bright, clean surface without any surface imperfections or shrinkage. That this problem has definitely been solved is best indicated by the statement recently publicized by a leading commercial steel treating company, which says—

"While it is perhaps dangerous to characterize anything in these fast moving times as the ultimate answer to troublesome problems, our own experience with commercial salt bath hardening of high speed steel would indicate that the advantages of the process can hardly be exaggerated. Irrespective of the size, shape or analysis, we have yet to see a tool come through the salt bath treatment with rounded corners, scale, pits or the slightest trace of decarburization. We feel that results are, as a matter of conservative fact, as close to perfection as we are ever likely to find."

This gratifying condition and ease of hardening high speed steel in a salt bath furnace is a fairly recent accomplishment. For years, decarburization and pitting occurred just as in other types of furnaces. Not until it was discovered that the cause of all the trouble was the introduction of oxides into the bath, did the solution present

Cuts Two 6"dia. Gear Blanks every 11 minutes

There are 12 MARVEL Saws at the Northern Pump Co., Minneapolis, some of which are in their tenth year of service. The Giant Hydraulic No. 18 MARVEL pictured above, is a comparative newcomer in the Northern MARVEL family, having been installed just a few months ago, to speed up production on large work. When pictured, it was cutting-off gear blanks from 6" dia. S.A.E. 3120 hot rolled steel, two at a time, cutting-off two blanks every 11 minutes.

Whether you want thin slices or long lengths cut-off from flat or round bars, MARVEL Saws will produce more pieces per hour and will cut them off at lower cost per piece than any other machine or cutting-off method. Included in the MARVEL System are small inexpensive dry-cutting shop saws; heavy duty all-ball-bearing high speed hack saws (the fastest saws built); automatic production sawing machines that require no more operator attention than an automatic screw machine; a metal-cutting band saw that saves hours of machining, roughing to size and shape; and a Giant Hydraulic Hack Saw, that cuts the toughest steel with ease. MARVEL High-Speed-Edge Hack Saw Blades are positively unbreakable, can be safely operated at maximum speed and feed on any hack sawing machine.

Buy from your local distributor.

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Ave., Chicago, U.S.A. Eastern Sales: 225 Lafayette St., N.Y.

Power Screwdrivers Cut Assembly Costs Motorized Hopper Units

A REVELATION IN HOPPER FEEDING

ADAPTABLE TO PRESSES, THREAD ROLLING MACHINES, CENTERLESS GRINDERS AND SPECIAL MACHINES

HOPPERS FEED RIVETS, SCREWS, SCREW BLANKS, NUTS, PLAIN WASHERS, AND SPECIAL PARTS

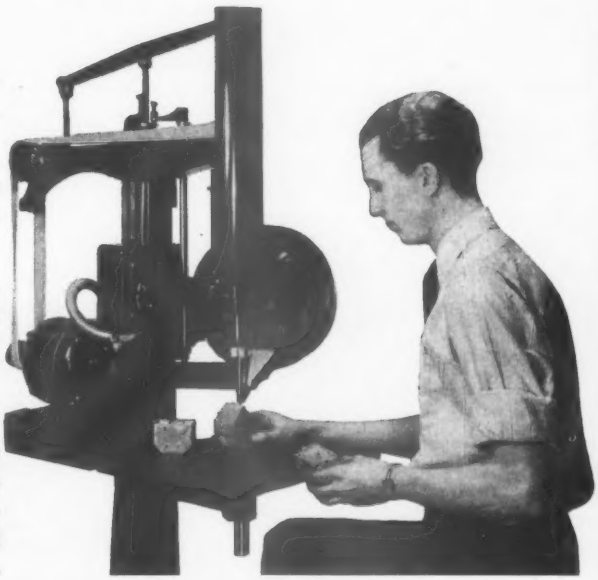
Three Models

Drive Screws from No. 2 to ⅜" Dia.

Driving Time 1 Sec. Per Screw.

Send Samples for Production Estimates.

Write for Additional Information on Magazine Power Screwdrivers and Motorized Hopper Units.



DETROIT POWER SCREWDRIVER CO.
5373 ROHNS AVE. DETROIT, MICH.

Having difficulty holding tolerances?

FLOATS RADIALLY

DEMAND THE

ZIEGLER

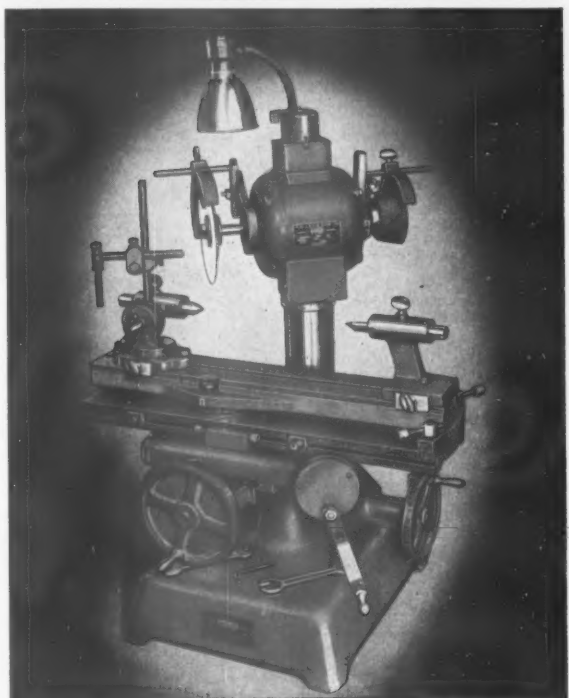
ROLLER DRIVE
Floating Holder
for
Taps and Reamers

AUTOMATICALLY compensates for machine spindle misalignment, eliminating over-sized or bell-mouthed holes.

Helps produce unbelievable accuracy on both new and old equipment.

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

W. M. ZIEGLER TOOL CO.
1920 Twelfth Street DETROIT



The New Model A600 Tool and Cutter Grinder
Our bulletin TCG41-8TE gives you all details.

K. O. LEE COMPANY

Aberdeen, South Dakota ★ U.S.A.

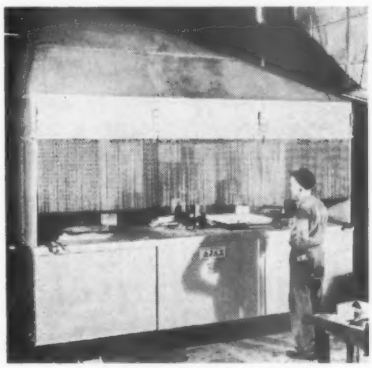
itself. The oxides entered the bath either from the reaction between the salt and the oxygen in the air or in the form of scale. These basic oxides attacked the surface of the steel and caused the decarburization. It was then found that the addition of an acid oxide to the bath removes the basic oxides from solution, forming an inert sludge which settles on the bottom of the pot, from where it is removed from time to time with a scoop.

As we all know, tungsten has become of extreme strategic importance in recent months due to the increased demands of our Defense Program and the difficulty of obtaining an adequate supply of tungsten from China—our only source of supply. Consequently, there is a definite trend away from the use of high tungsten steels such as the 18-4-1 high speed steel.

Fortunately, something was done about the same critical enigma that existed in the last war, which resulted in the development of the molybdenum type high speed steel, having a very small percentage of tungsten. These moly steels have been out in industry for a number of years and in most cases give results equal to or better than the ordinary 18-4-1.

Experience has shown, however, that the moly steels require special care in heat treatment because they are more sensitive to temperature and decarburization. One of the main factors accounting for the increased use of salt baths for hardening high speed steel tools in recent years, is the ease with which they handle these moly steels, avoiding all danger of soft skin, scaling, pitting, etching or other surface defects.

Neutral hardening of carbon and alloy steels at temperatures from 1500



Preheat, High Heat, and Quench
Hardening high speed steel tools at temperatures up to 2400 F.

to 1850 F. would appear to offer less obstacles than hardening high speed steels at much higher temperatures. Actually the problem has been more stubborn, and only recently have neutral salt baths become available that permit work to be handled satisfactorily at these medium temperatures.

Age Hardening and Tempering

These two widely different types of heat treatments jointly come within the low range of temperatures and are done in the same kind of salt baths, namely, nitrate or nitrite mixtures. The most outstanding example of age hardening is presented by the aluminum alloys as used in the aircraft industry. Extremely close temperature control is required and rapid heating has special significance. Some of these aluminum alloys are subject to grain growth through a temperature

TANNEWITZ DI-SAWS

Do in **MINUTES** *jobs which otherwise require* **HOURS!**

Conservatively estimated TANNEWITZ DI-SAWS save an average of 70% of the time and cost involved in making inside and outside cuts on dies, shoes, templates and the hundreds of other operations, including filing and polishing, to which these machines are ideally adaptable. In many instances they are turning out work in as little as ONE-TENTH of the former time required.

To expedite production and cut costs, by all means investigate the tremendous possibilities these machines offer in tool and die making and other applications.

The popularity of DI-SAWING is growing by leaps and bounds. Get the complete facts on the most highly developed DI-SAW on the market. Simply write for our DI-SAW Bulletin.

	SAWING SPEEDS PER MINUTE				
THICKNESS	CAST IRON	COLD ROLLED	TOOL STEEL	HI SPEED STEEL	HI CHROME HI CARBON
¼"	16"	9"	5"	2⅜"	1½"
½"	8"	4½"	2½"	1⅛"	¾"
1"	3½"	2¼"	1¼"	½"	⅜"
1½"	2"	1"	⅝"	5/16	3/16"
3"	1"	½"	5/16"	5/32"	3/32"
6"	½"	¼"	5/32"	5/64"	1/32"

Made by Sawing Machinery Specialists

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

MOREY VERTICAL SHAPERS

Built in two sizes
8" stroke
12" stroke

Accurate—simple for toolroom manufacturing. Self-contained motor drive.

Ask for Circular No. 726

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

GAMMONS
OF
Manchester

PRODUCTION TOOLS

ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN

MODEL 'A' CLEVELANDS AT LeBLOND MACHINE TOOL MAKE SMALL PARTS FAST

• Of utmost importance to any machine tool builder is the fast production of the multitude of small parts that enter into the construction of his equipment. These must be produced to exacting, close tolerances, and in comparatively small lots. For this purpose, LeBlond Machine Tool Company relies upon Cleveland *Single Spindle* Automatics—such as this one shown, a 5¾-inch capacity Model A engaged in producing a number of different size gear blanks for the LeBlond engine lathe. It is fast, easily tooled up, quickly changed over for small lot production, and very accurate. This machine has a 4-speed motor drive, variable tool feed and universal camming. Ask for bulletin describing it.

THE CLEVELAND AUTOMATIC MACHINE COMPANY
2269 ASHLAND ROAD, CLEVELAND, OHIO

Sales Offices at:
Newark, 15 Washington Street • *Detroit*, 2842 Grand Boulevard
Chicago, 565 W. Washington St. • *Cincinnati*, 507 American Bldg.

CLEVELAND *Single Spindle* AUTOMATICS

range from 700 to 800 F., whereas the grains are unaffected at the critical hardening temperature of 940 F. This is quite different from the factors governing grain growth in iron alloys, where it is purely a function of time and temperature.

I doubt if there is a single aircraft plant in the country that doesn't have at least one salt bath for treating aluminum alloys. For one reason, the Navy Department is quite specific in indicating the type furnace to be used. In this field, electrode type furnaces are used with bath dimensions as great as 20 ft. by 3 ft. by 5 ft., and a connected load of 250 KW.

For drawing steel parts in the temperature range of 300 to 1100 F., the salt bath is just another good way of doing it. Admittedly, the forced convection type furnace is doing a very fine job.

Annealing

The salt bath method has only a limited application for annealing. Where the metallurgical requirements dictate holding the work at a given temperature and then slowly cooling it in the furnace, the salt bath cannot be used if the final furnace temperature is below the freezing point of the salt. In most cases, this will be found to be so, because the choice of salt mixtures for annealing purposes is very limited. For example, the chloride-carbonate salt used for annealing at 1200 to 1500 F. has a melting point slightly above 1000 F. Therefore, if it is desired to slowly cool the charge from say 1375 F. to 900 F.—as is often required in spheroidizing—it obviously cannot be accomplished in a salt bath.

The salt bath has, however, done a splendid job in annealing work where it is simply a matter of heating to a given temperature as quickly as possible, holding the work at temperature for a short soaking period and then quenching in water or cooling in air or any insulated chamber. Some such typical operations are annealing low and high carbon steel wire in coils, sterling silver wire, bars and stampings, copper alloy bars and rods, etc.

Brazing

The development of salt baths for specific purposes is largely a matter of trial and error. The chemistry of molten salt mixtures gives very little prior information as to what actual results can be obtained. In a way, this may be fortunate when we compare progress with the controlled atmosphere furnaces. Gas atmospheres consist of chemical compounds well known in elementary chemistry, and it is quite easy to erect a plausible hypothesis about how they react with each other and the hot metal, but not so easy, one may venture to remark, to make them act that way in an operating furnace.

Out of such cut and try research work, we were able to develop an entirely new brazing technique, namely, dip brazing in a molten salt bath. By the very simple process of dipping either ferrous or non-ferrous assemblies in the electrode type salt bath furnace, any number of joints may be brazed simultaneously in a matter of seconds. As soon as the immersed joint has reached the bath temperature, which is maintained slightly

"First, DBL gives you performance as good or actually better *than 18-4-1 High Speed Steel. Second, you use exactly the* same *heat-treating equipment—nothing new to learn or buy!"*

And what's more, DBL High Speed Steel helps to protect you against possible alloy shortage—it contains less than one-third as much tungsten as 18-4-1. Also, it costs less and is lighter than 18-4-1 . . . you get more pounds per dollar and more tools per pound.

There's at least 5 WAYS (count 'em) that DBL High Speed Steel can benefit you—against *no* disadvantages. • Write for our new "Handbook of Special Steels"—it contains valuable technical data on DBL and other A-L products. *Just use the coupon below.*

ALLEGHENY LUDLUM
STEEL CORPORATION — PITTSBURGH, PA.
Tool Steel Division — *Watervliet, N.Y.*

T-147

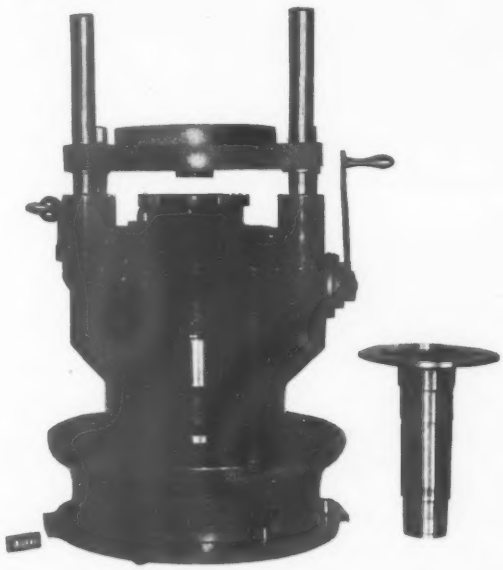
Allegheny Ludlum Steel Corporation
Oliver Building, Pittsburgh, Penna.

Send me a copy of your "Handbook of Special Steels."

NAME_____
COMPANY_____
ADDRESS_____

SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley Ave. **Detroit, Michigan**



-DESIGNERS-
-BUILDERS-

EQUIPPED TO HANDLE ANY
OF YOUR TOOLING
REQUIREMENTS
BUILDERS OF STANDARD
FIXTURES AND FIXTURE
LOCKS

ASK FOR CATALOG 238

A TWO STATION INDEX FIXTURE TO DRILL A CIRCLE OF CLOSELY SPACED HOLES IN SHAFT FLANGE. LOWER ADAPTER CHANGED FOR VARIOUS LENGTH PARTS. TOP PLATE CLAMPS PART WITH STANDARD LOCK.

NEW *Vernon* VERTICAL MILL and JIG BORER

THE ONLY MACHINE IN THE LOW PRICE FIELD on which Jig BORING Equipment can be furnished as a standard extra.

PROMPT DELIVERY

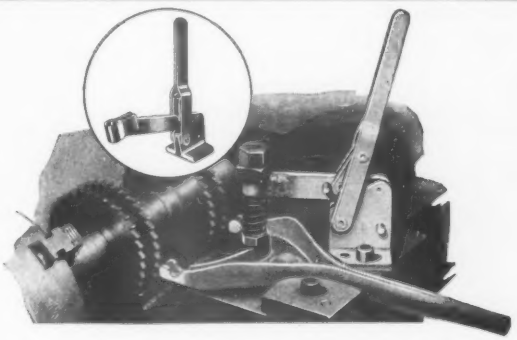
Equipped with *Dial Indicators* and *Measuring Rods*, the *Vernon* is invaluable for *smaller jig boring operations.*

WRITE FOR FOLDER

MACHINERY MANUFACTURING COMPANY

1915 E. 51 St., Vernon, Los Angeles, California

Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS & JIG BORERS, 11" SHAPERS & GRINDERS



for Low Cost Production

Use DE-STA-CO Toggle Clamps

In every operation where parts must be held in fixtures for drilling, milling, welding, assembly and the like, the production *rate* depends upon positive clamping—and instant release . . . And production *costs* likewise.

De-Sta-Co quick-acting Toggle Clamps are nationally recognized as the efficient, low-cost method of designing and carrying out production . . . Write now for Bulletin No. 40, showing types and sizes best fitted to your requirements.

DETROIT STAMPING CO.

Established Over 25 Years

356 Midland Ave • Detroit, Mich.

above the melting point of the brazing alloy, it is removed, quickly quenched or slowly cooled in air as required. The protective film of salt prevents scaling or decarburization.

In many respects, this new method reverses the brazing technique as employed in hydrogen brazing furnaces. Instead of enveloping the work in a gaseous atmosphere, slowly heating the assembly and finally cooling it down even more slowly in closed chambers, the salt bath dip brazing process seals the work from all atmosphere or fluxes and consequently simplifies the entire operation.

Aircraft Plant Furnace
Used for heat treating aluminum alloy sheet, sections and rivets.

The decarburizing difficulties encountered in brazing carbon steel parts in hydrogen furnaces—necessitating a costly reheating operation to correct the damage done in brazing—is not only avoided but the work can be simultaneously carburized and brazed if desired. One salt bath brazing installation is producing 200 sets of Bendix type starters per hour. The starter consists of three separate assemblies, which are brazed and carburized to a depth of .018 in., all in one heating operation. Muntz Metal is used for the brazing alloy and the bath is operated at a temperature of 1675 F. The single furnace used for this production has bath dimensions of only 42 in. long by 20 in. wide by 18 in. deep.

Other commercial salt bath installations are being used for brazing such work as copper heat exchange units, business machine stampings, oil filters used in automobiles, etc.

Selective Heating

Except for work that lends itself to induction heating or lead baths, the salt bath offers probably the only solution for selective or end heating operations. The dip brazing process just mentioned is a good example of selective heating. Some others are selectively carburizing steel parts of various kinds, such as pinion gears for tractors. Perhaps the most spectacular use to which the salt bath has been put is in connection with the nosing or closing-in operation in the manufacture of artillery shells and bombs. This operation requires heating only a portion of the length of a hollow, tubular forging to a temperature which permits the end to be closed-in in a press to form the nose of the

TODAY'S DEMAND *Speedier Production!*

TODAY'S ANSWER "ASCO" DIAMOND TOOLS

If you're at wit's end on how to speed Defense production, use "Asco" Shaped Diamond Tools for your turning, boring and drilling operations . . . and immediately produce more work per machine. Diamonds—the hardest substance known—far surpass all tool steels for speedy, accurate, durable cutting qualities on toughest steels, alloys, compositions and abrasive materials. "Asco" Diamond Tools cut to close tolerances—stay on the job much longer—produce a superior finish which often saves polishing and grinding. Send blueprints of special shaped tools for quotation.

Typical Shaped Tools

Landis Nib, Norton Nib, Cincinnati Nib

IMMEDIATE SHIPMENT ON ALL DIAMOND TOOLS AND RESETTING

For more than 30 years Anton Smit & Co., Inc., has specialized in industrial diamonds. In addition to tools, large stocks of Bortz, Carbons, Ballas, Cleaved or Natural Points, Crushing Boart, Splint, Powder, etc., are always on hand. Write for illustrated folder.

DRESSING TOOLS, SHAPED TOOLS, DRAWING DIES, CORE BITS, PHONO POINTS, ETC.

ANTON SMIT & CO., INC.
24 STATE STREET - - NEW YORK, N. Y.
TELEPHONE: BOWLING GREEN 9-0616
IMPORTERS OF INDUSTRIAL DIAMONDS—BORTZ, CARBONS AND BALLAS.
MANUFACTURERS OF ALL KINDS OF DIAMOND TOOLS.

More and More

Users are coming to Acme for their jig bushings

Buying bushings releases your men for more important work, and insures high quality because Acme bushings are made by specialists.

ACME INDUSTRIAL COMPANY

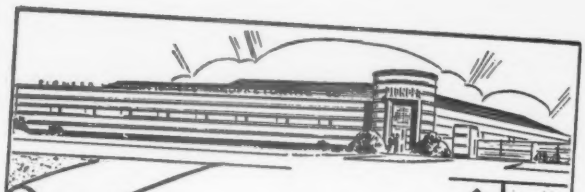
208 N. Laflin St. Chicago, Ill.
MONroe 4122

FRAY
MICROMETER
OFFSET BORING HEADS

WRITE FOR BOOKLET

FRAY
MACHINE TOOL CO.
Makers of
"ALL ANGLE"
MILLING MACHINE &
MILLING ATTACHMENTS

505 W. Windsor Road Glendale, California



HERE'S A STAFF OF

366 Engineers

. . . thoroughly experienced on government specifications

ready to relieve you of some of your burdens in meeting the demands of today's exigencies

We're in our new home now—with expanded facilities and increased personnel—helping scores of manufacturers put new and unfamiliar products into production . . . determining methods and applying equipment now available . . . designing tools, jigs, fixtures, gages and other special devices.

. . . and in many other ways contributing the required help that will expedite today's new and different production.

Our large volume of business enables us to function at highest efficiency.

We can help you with your problems —whether large or small.

PIONEER ENGINEERING
AND MANUFACTURING CO.

19645 JOHN R STREET
DETROIT • MICHIGAN

shell. The temperatures used vary from 1450 F. to 2100 F. depending on the size shell and wall thickness. This is a very fussy job and the requirements for first-class work can be summarized as follows—

(1) Uniform temperature of heated section regardless of variation in wall thickness.
(2) Exact control of the length heated.
(3) Sharp break between the heated and cold sections. This is necessary in order to retain adequate strength in the cold portion of the shell and hold its shape while the nose is being formed.
(4) Heated section must be parallel to the base of the shell, otherwise wrinkles or eccentricity result.
(5) Scaling and decarburization should be entirely avoided. This is particularly important with respect to the inside of the shell because it is very difficult to sand blast it after nosing.

The slot-type and rotary fuel-fired furnaces which were formerly used for this heating operation fall far short of meeting the above requirements, whereas the salt bath meets all of these ideal requirements perfectly.

Salt bath furnaces are already playing an important part in this phase of our present Defense Program, and have been applied to the selective heating operation for nosing 75 mm., 90 mm., 105 mm., 5 in. and 155 mm. shells, as well as 14 and 18 in. diameter demolition bombs. One of these bomb installations involves three furnaces, each with a bath measuring 18 ft. long, 3 ft. wide and 3 ft. deep, with a power input of 700 KW. Certainly this is a rather bold advance in salt bath furnace design compared with the conventional small gas fired pot furnace of only a few years ago.

Forging

The shell heating application just discussed is, of course, a forging operation. A few other rather interesting forging jobs are now being done, such as heating carbon steel bars for upset forging work. Our venture into this field is quite recent and it is too premature to make wild claims that cannot be substantiated with factual data. When we look back over the past twenty years and see the wreckage of other attempts made to apply electric heat to the forging industry, we must proceed with caution. In any event it does appear that the inherent advantages of the electrode type salt bath furnace offers a new approach to meet the severe requirements of the forging field.

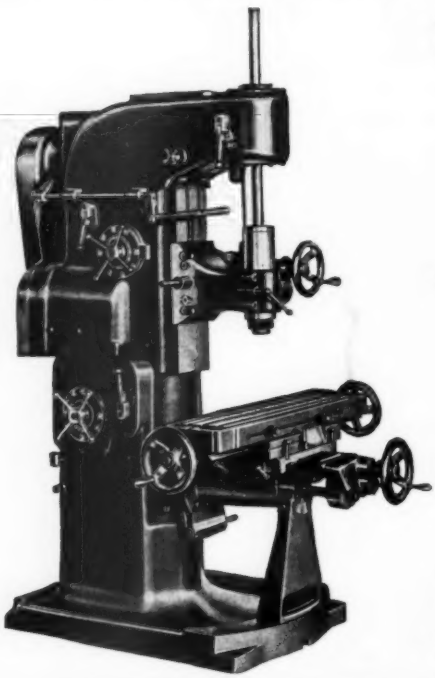
Consider **THESE FACTS**

HERE'S WHAT THE

KNIGHT MILLER

GIVES YOU

1. Vertical adjustments are quickly made by moving the counterbalanced spindle head—no heavy table unit to raise or lower.
2. Table unit swivels and tilts, thereby saving time by eliminating special equipment and re-setting of work.



3. Operator doesn't lose time changing tools because brake stops spindle immediately, and Knight method of holding and changing cutters is fast as well as positive.
4. Quick operating, easy reading dials and readily accessible shift lever saves operator's time and makes him a better producer.
5. Operator reduces his machine handling time and fatigue.

Let us send you further details regarding this profit-producing machine.

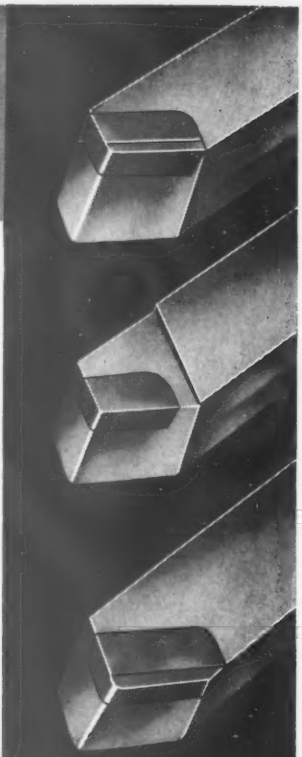
W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •

25th Anniversary For Logansport

Logansport Machine, Incorporated, is paying tribute to Frank B. Wilkinson in commemorating the Twenty-fifth Anniversary of the founding of the company.

From a modest beginning, Logansport Machine has grown to a position of leadership in the Air and Hydraulic Equipment fields. The company states that in honoring its founder it is also acknowledging the splendid cooperation of friends in industry and rededicating the Company's efforts to a continuing service to industry and to National Defense.

Stop Those Production Blackouts!



TECO Carbide Tools will cut down non-productive machine time, give you more production per machine, fewer expensive, time-killing rejects, and better surface finish. That's why TECO Tools are preferred by men who have to get things done — or else! When you're up against a heavy production schedule and have to do the job faster — and better, use TECO TOOLS.

Here's why TECO CARBIDE TOOLS reduce costs and speed up production—often more than 75%.

Rough and finish in one cut • 10 to 50 times more pieces per grind • Machine steel up to 550 Brinnel — without annealing • Reduce floor to floor time up to 30% • Increase tool life as much as 200%.

TECO METAL is available in grades suitable for cutting almost any machinable material. Ask for a shop demonstration without obligation, and use Teco's consulting service whenever there's a tool problem to solve.

Tungsten Electric supplies Carbide Blanks, Tools and Bits, Wire and Bar Dies, Tubing, Extruding and Sizing Dies, also special tools such as Spot Facers, Reamers, Combinations, Broaches, Forming Tools, and TECO METAL for hard-surfacing parts subject to unusual loads.

TUNGSTEN ELECTRIC CORPORATION • 570-39th STREET, UNION CITY, N. J.

Branch Office: 2900 EUCLID AVE., CLEVELAND, OHIO

Pioneers in Tungsten Carbide for over a Quarter of a Century

TECO CARBIDE TOOLS *pay dividends!*

MOREY "27" SEMI-AUTOMATIC HEAVY DUTY LATHE

Just the Machine for Shell Work!

Suitable for rough or finished turning shells at maximum feed.

Put your shell operations on this fast powerful lathe and turn out your work at top speed up to the limit of tool capacity.

Multiple tool holders can be supplied at front and rear; a turret mounted on separate saddle can be used instead of tailstock.

Full use of carbide tools can be taken by this heavy duty lathe.

Ask for Circular No. 715

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

DIE MAKERS - why not take the straight road?

CERROMATRIX HIGHWAY

OLD FITTING-AND-FILING METHODS

America needs dies and tools fast for its tremendous national defense program. This, therefore, is no time for slow, out-of-date methods of production.

CERROMATRIX, the low-temperature-melting bismuth alloy that expands slightly on solidifying, offers die makers a sure method of cutting many hours — yes, even days, from the time required to make dies the old way. This remarkable alloy secures punch and die parts swiftly, accurately and rigidly. Why use a detour, when a straight, paved highway lies before you?

SEND FOR FREE MANUAL

CERRO DE PASCO COPPER CORPORATION

Multiple Series Press Welding

A new development by Tool Engineers speeds assembly of welded panels in many automobile plants through the use of a line of welding presses.

By JAY GILBERT

PRODUCTION of welded panel assemblies has been simplified and increased by the introduction of multiple series press welding at many body assembly plants. Utilizing an elementary resistance welding procedure, series spot welding, and a modified cam actuated press of adequate base size, the Tool Engineers have developed a new tool for the industry.

Spot welding has long been recognized by production men as a fast and economical method of assembling metal stampings. As the industry turned to this type of assembly the resistance welding machine manufacturers in turn developed equipment capable of economically handling the various welding problems presented them. Among these were the body flash welder, the portable gun welder, the heavy duty projection welder and butt welders.

However as the automobile industry developed the all steel body there were certain panels too large to be handled by existing welding machines and with sections and contours that made it impossible to assemble by ordinary methods. With this in mind the production Engineering Department set to work to devise ways and means of meeting this problem.

It is axiomatic in industry that any production method that will increase production with no increase in production costs will be installed even if the existing processes and machines are adequate and new. Indeed the cost of new processes can often be amortized in a short period of production even if the net saving per part is exceedingly small. This policy coupled with the fact that existing methods were inadequate allowed the engineers great latitude in their design costs and procedure.

One of the first methods considered by the designers was an elaboration of the conveyor system. It appeared that by mounting the panel to be welded on a suitable fixture that in turn was mounted on a conveyor would solve the problem of handling large panels. This method evolved into the famed "merry-go-round" used in the production of floor pan assemblies.

Method Extended

The conveyor system was extended to other panel assemblies in the body and simplified to meet the varied conditions presented by each assembly. It was apparent to the engineers that they had as yet only temporized and had not solved the problem to their satisfaction. Certain contours could not be welded on the conveyors because of the fact that the welding electrode or "tip" must be normal to the panel within a few degrees for satisfactory welds. These welds had to be made at repair stations with special gun welders which entailed a tooling cost that was large for the amount of work done. Finally there was the

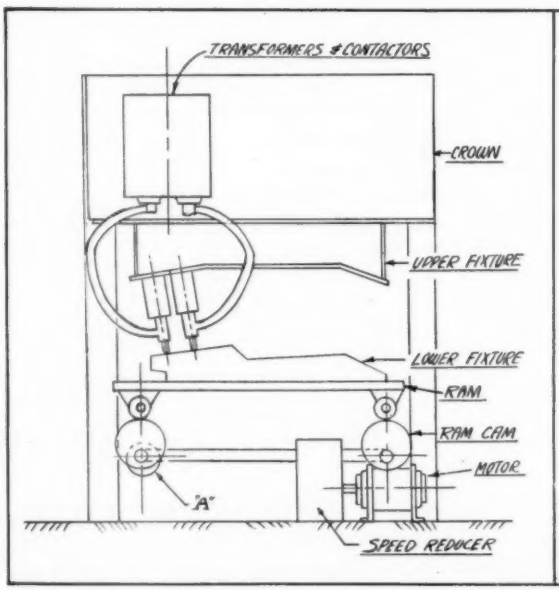


Figure 1

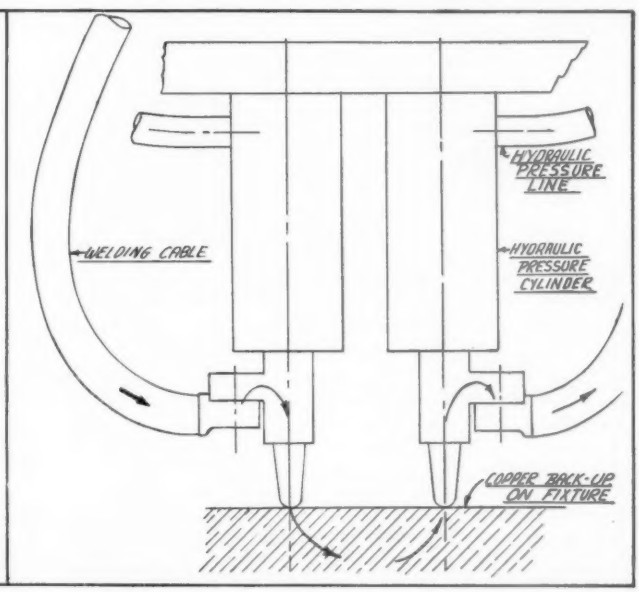
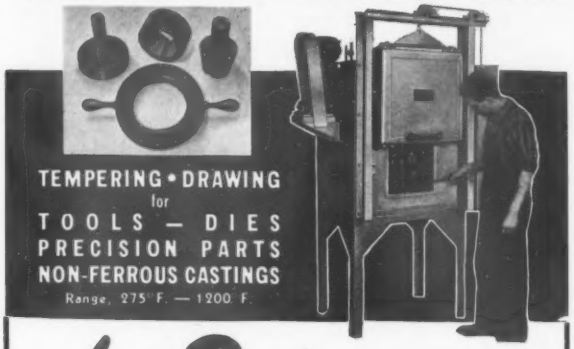


Figure 2

More Production



TEMPERING • DRAWING
for
TOOLS — DIES
PRECISION PARTS
NON-FERROUS CASTINGS
Range, 275° F. — 1200° F.

for Defense!

NEW TOOL ROOM FURNACE

Prompt Deliveries Maintained!

This furnace is responsible for increasing production in countless defense plants. Its convenience, its accuracy and general usefulness will improve your precision heat treating. Available in 12 standard sizes.

WRITE TODAY FOR BULLETIN NO. 83 T for complete details and prices on gas or electrically heated furnaces.

DESPATCH
OVEN COMPANY · Minneapolis, Minnesota

Send for Valuable Booklet

Forgings For All Industries
Rough Turned or Finished Complete

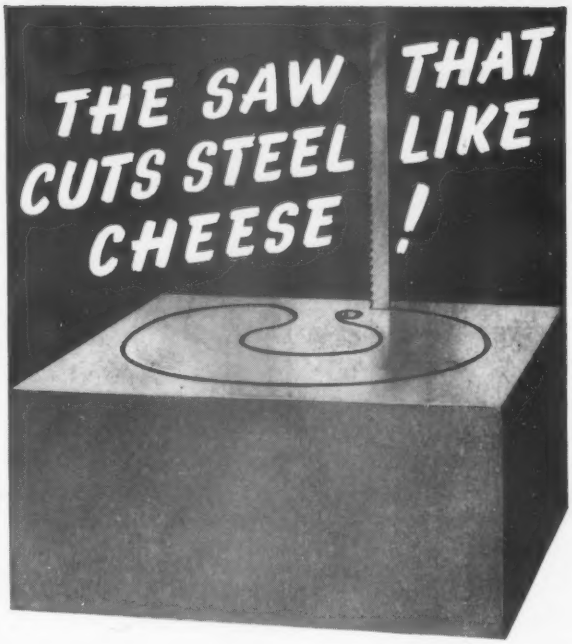
Composite Die Sections
Extrusion Tools
Crankshaft Forgings
Gear Forgings
Die Casting Dies

Rings, Discs, Blocks, Shafts, Hubs, Bars, and Special Shapes.
Tool Steel of all Makes
S.A.E. Specifications

STAINLESS & COPPER FORGINGS

May We Serve You?

AJAX STEEL & FORGE Co.
205 ADAIR STREET **DETROIT, MICHIGAN**



This saw is cutting the toughest stuff in the shop —die steel 10" thick. It will cut any material— armor plate, plastics, etc., as smoothly as cheese.

Q. What is remarkable about the cut?
A. The kerf is curved, following layout line, with minimum radii $\frac{3}{16}$" and corners notched ***point clean.***

Q. What saw does this?
A. Milford PROFILE SAW.

Q. Is a special machine necessary?
A. No. Many makes of "contour-sawing" machines are in use, but any good jig or band saw machine with fixtures will do this class of cutting if provided with the proper saw. THE SAW DOES THE CUTTING, NOT THE MACHINE.

Q. Does profile saw have to be good?
A. It has to be "perfect" — in design, in steel, in milling, in heat treatment and in scores of other ways to withstand extraordinary working stresses, since saw as narrow as $\frac{1}{16}$" is used. Milford PROFILE SAW is remarkably durable.

Q. Who originated profile saw?
A. Milford, the world's largest producer of metal-cutting band saw, with more than 50 years experience making this difficult product.

Q. How is Milford PROFILE SAW handled?
A. It is packed in 100' coils, magazine-boxed. Various sizes are stocked by mill supply houses in all localities.

WRITE FOR FREE SAMPLE, GIVING SPECIFICATIONS OF SAW YOU NOW USE, AND MAKE OF MACHINE

THE HENRY G. THOMPSON & SON CO., NEW HAVEN, CONN.

MILFORD
PROFILE SAW
REZISTOR HACKSAW BLADES

breakdown item that was admittedly the biggest "bug" in the job.

Due to the nature of the conveyor it is as strong as its weakest assembly point. Let one station go bad and the whole conveyor is shut down until the fault is corrected. Coupled with this was the fact that the yearly change-over required that every one of the many moving fixtures be remodeled as well as the welding stations. This led the engineers to look for another method of approach to the problem.

As the plant layout of many assembly plants place the welding machines in and about the press room it was apparent that if the panels could be welded in the same manner as they are formed, namely, the press, the break-down hazard would be localized and valuable floor space saved. With this in mind the designers again went to work.

In their new design the engineers brought forth a simple structural steel framed press with the ram in conventional top position and the operating mechanism, crank and pitman, operated by air and hydraulic power. The bed of the press had the fixture mounted upon it while the ram served the double purpose of having the transformers and the hydraulically operated series welding tips mounted upon it. As the design advanced it was decided that the conventional press movement was not what was wanted and a new method of movement had to be developed.

In due time a design was approved that not only gave the correct mechanical movement but also permitted the use of a roll conveyor through the press that simplified the handling problem. The design is shown in a sketch, Fig. 1. Motion is imparted to the ram which is in the bed of the press by four cams geared together and operated through a suitable gear reducer by a motor of correct size. This motor is stopped with a solenoid brake and the press controlled by push buttons mounted at approved positions on the press columns. As the panel with parts prelocated by lances, pins and depressions is placed in the fixture mounted on the ram, the cams raise the fixture to welding position and hold it in this position for a predetermined length of time to permit the welding cycle to be completed.

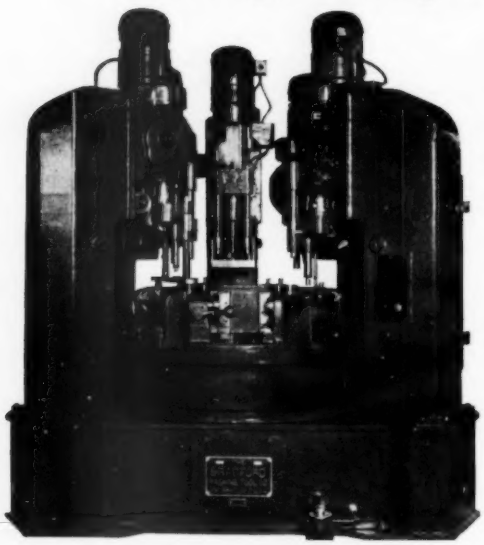
Tips Preloaded

With the fixture rising, the panel and parts contact the welding "tips" early in the rising and force them back into their pressure cylinders. This small movement lessens the amount of oil required to fill the cylinders and puts a slight preload on the tips.

Mounted on the cam shaft is a sequence control cam "A" that is adjustable and controls the hydraulic and electrical systems. When the panel is in welding position the sequence control applies the hydraulic pressure to the welding cylinders. When full pressure is evenly applied to all of the tips the welding sequence begins.

In the design of the electrical controls the electrical engineers devised a method of operation that was simple yet foolproof. It is a physical impossibility to simply energize all the welding transformers at the same instant. In the first place the use of a contac-

HAVE YOU A "TOUGH NUT" TO CRACK
In Boring, Drilling or Tapping?



BRADFORD Unit-Type Self-Contained Single or Multiple Heads

★ Right now, you may have a "tough nut" to crack on some difficult drilling or tapping problem. If it's "different"—or, if it's costing too much money by present methods—or, as we are quite sure, you've just got to step up production — we have had plenty of experience in cracking such tough nuts.

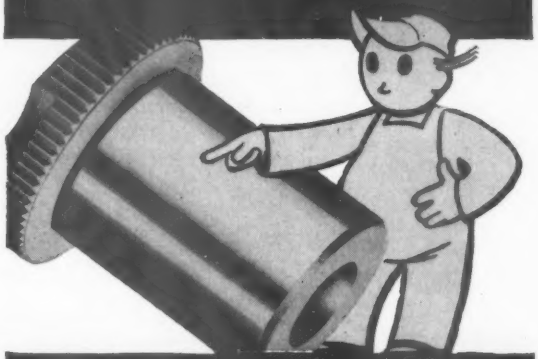
Our engineers are working with Tool Engineers every day—solving complicated problems, simplifying operations, increasing capacities. Give us a call—or send us a blueprint of that tough job to be drilled, tapped. We'll estimate on a better, faster way through the Bradford Unit-Type Heads. We have designed many special heads for unusual applications, there are several "standard types" to choose from—single or multiple spindle. Get in touch with us.

Also manufacturers of the BRADFORD New Geared Head Lathes. Write for free Bulletins.

THE BRADFORD MACHINE TOOL CO.
CINCINNATI, OHIO
PRECISION TOOLS SINCE 1840

FOR ACCURATE DRILLING YOU CAN'T BEAT UNIVERSAL DRILL BUSHINGS . . .

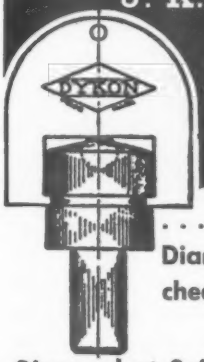
Super-finished bore straight and round within .0001 assures accuracy and unexcelled wearing qualities. Nickle steel lock screws provide extra strength. Cadmium plated screws prevent rusting. Knurled head allows better grip. Black dome improves appearance, resists rust. Write for data sheet.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH · MICHIGAN

Save Your Diamonds WITH J. K. SMIT & SONS, INC.

DYKON GAUGE



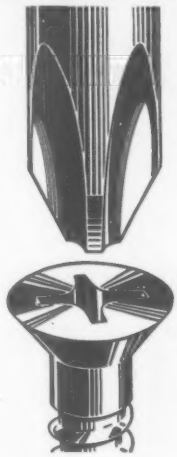
. . . the device that protects your Diamond Tools from abuse, that checks loss . . . insures longer use.

Diamond at Safety Line. Position of the DYKON Gauge indicates that Diamond has worn to lowest safety level and should be returned for resetting.

Are You USING or ABUSING and LOSING?

J. K. SMIT & SONS, INC.
157 Chambers Street, New York, N. Y.
7 South Main St., West Hartford, Conn. Law and Finance Bldg., Pittsburgh, Pa.
Detroit — Chicago — Seattle

APEX POWER BITS



are tough . . .

And not only tough, but they are heat-treated for hardness and wear-resistance as well.

They stand up under hard usage.

The precision fit of the blades gives a sure grip in the recess of the Phillips screw . . . there is greater holding power . . . more driving force . . .less work spoilage . . . faster production.

No matter what power driver you are now using, there is probably an APEX-Phillips Power Bit to fit it, as there is for most makes of electric, air and spiral drivers.

And that isn't all, either . . .

Economical to use, too

APEX-Phillips Power Bits can be reconditioned for an added saving, when worn. Each reconditioning shortens the Bit approximately 1/8". The reconditioned Bit is equal to the original in every respect—possible only because of the high grade of steel used. Long shank bits can be reconditioned time after time before scrapping—a sizeable savings.

Write today for a free copy of the APEX Manual and Catalog

The APEX MACHINE & TOOL Company
1101 Patterson Blvd. Dayton, Ohio

tor to handle the primary current required to a group of six to ten 100 KVA transformers would entail too great a risk to equipment and the possibility of a complete breakdown. Then too the cost and maintenance of such a set up would be high. Finally the instantaneous power demand under the aforementioned conditions would place a severe and probably paralyzing demand on the plant's power supply.

As each transformer would draw no more power than the average spot welder although it made eight separate spot welds at the same instant, an arrangement to energize each transformer, one after another, was originated. Air contactors were used and the exhaust air from the first contactor was used to start the second contactor and so on until all the transformers had been energized. This required a contactor for each transformer but sufficient room had been incorporated in the design of the crown of the press to contain all the necessary equipment without undue crowding. As all the welding equipment is easily accessible a break-down is quickly repaired. Standardized cables and connectors, simplified hydraulic fittings and the use of a simple yet efficient hydraulic welding head in all installations allow the maintenance crew to repair or replace defective parts with minimum time lost to production.

After the welding cycle is finished the ram cams quickly lower the fixture and the completed panel assembly is loosened from the fixture and rolled out of the press on the conveyor with little effort on the part of the operators. A new group of loose parts is placed in position on the panel and the operation is repeated.

Press Line Required

It must be remembered, however, that no single press could perform all the welding required on the average assembly. Not alone because of the number of welds required but because of contours requiring welding tips to be set at practically any position in a hemispherical area. Just as no large panel is completely finished in one forming press but passes through many presses in the process of manufacture, so must the welded assemblies be put into many different welding presses to efficiently do their task. In fact it was demonstrated that a press line composed of regular metal forming presses and welding presses placed in the proper sequence would be able to produce completed assemblies faster, more accurately and using less floor space than any other method.

Finding that their new creation was invaluable in production of large floor pans the engineers then scaled down their six by ten foot bed area machines to smaller copies used in similar processes connected with the production of door panels, deck panels, seat assemblies, and other similar parts. Production men in the assembly plants who have to live with their equipment were soon convinced that this new tool was fundamentally sound and with a few minor change recommendations the series welding press was incorporated in the plant layout as a fast, flexible, and proven production tool.

JARVIS

FLEXIBLE SHAFTS, EQUIPMENT AND TOOLS

A great many Jarvis flexible shaft machines are used 24 hours a day to sand and polish aircraft propellers.

POLISHING A BLADE WITH JARVIS FLEXIBLE SHAFT MACHINE

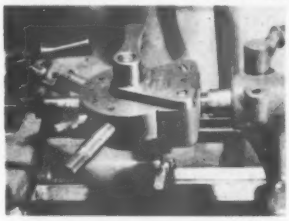
DISC SANDING WITH SPECIAL 2 H. P. JARVIS UNIT

THE CHAS. L. JARVIS CO.

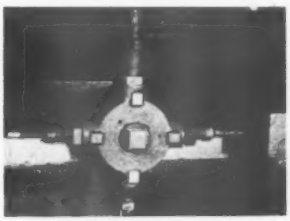
MIDDLETOWN, CONN.

CHICAGO BRANCH OFFICE AND STOCK 1344 W. WASHINGTON BLVD.

STOP WASTE MOTION
INCREASE PRODUCTION
with
QUADRUPLEX
LATHE & MILLER ACCESSORIES



QUADRUPLEX TURRET TAILSTOCK
$16.25 F.O.B. BLOOMFIELD, N.J.



QUADRUPLEX MILLER STOP
LATHE STOP $19.75 F.O.B.
MILLER STOP $25.00 F.O.B.

NOW, you can eliminate production bottlenecks at minimum cost. Your present equipment, fitted with QUADRUPLEX turret tailstocks and lathe and miller stops, is immediately capable of multiple machining operations. A mere flip of the lever permits the start of a new operation in a fraction of the time which it normally takes to change tools and readjust distances.

SAVES TIME, SAVES DOLLARS, SPEEDS PRODUCTION
WRITE TODAY FOR DETAILS

SPECIALTIES MANUFACTURING COMPANY, Inc.
35 Farrand Street **Bloomfield, N. J.**

Columbia
TOOL STEEL

MOLITE—5
A molybdenum type high speed steel.

Carbon	.80%
Chromium	4.00%
Tungsten	5.00%
Molybdenum	5.00%
Vanadium	1.50%

The all-purpose, heavy duty alternate for 18-4-1.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE PRESIDENT
GENERAL OFFICES AND WORKS
810 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

A FAR CRY FROM THE SOLID CUTTER
ARE THESE INSERTED-BLADE DESIGNS

YET far too many plants are trying to keep up the pace of today with outmoded equipment. In these Dual Adjustable Cutters—which are only a part of the O K line—tapered, serrated blades fit into mating slots in the cutter body. There they are immovably held without wedges, pins or set screws—yet they may be quickly removed. As the slots are at an angle to the body, when the blades are set out one or more serrations for regrinding, both radial and axial adjustments occur at the same time ***automatically!*** This not only saves time in moving the blades out into line of wear, but actually results in 65% blade usability.

DUAL ADJUSTABLE
Longer blade life—due to automatic radial and axial adjustments

The new blades and cutter bodies are available for either roughing or finishing. In the roughing cutter (above) the blades are inserted radially into the body and shear into the work in the direction of feed. Major wear and adjustment are on the periphery, the face of the blade merely scraping the work just cut.

In the finish milling cutter (left) the blades are inserted into the periphery and are ground with a slight lead to produce a "skiving" cut. Here the major blade wear and major adjustment are on the face. A folder describing the "Dual Adjustable" principle will be sent on request.

THE O K TOOL CO., SHELTON, CONN.

TRADE OK MARK **SYSTEM**
OF INSERTED-BLADE METAL CUTTING TOOLS

Handy Andy Says—

ABOUT every time I pick up a trade paper, of late, I see mention of some of the boys, or their pics. Must be great to be a celebrity like that. The only time my phiz crashed the printed page was in a football group, and they called me the Great Orlando. My one shot at fame!—and they mixed me up with a winter resort. Or a cigar, which? Another time I was captain of a bowling team, and we won the cup a/c there were four bowlers and myself. They got McGillicuddy, Kulczinskivitch, Schnitzenheimer and Provenzanorelli right, but mine they engraved Collander, maybe from the splits I used to get. *Sic itur ad astra!* But that's nothing. The other day I got some literature from a car dealer, addressed to Abe Rylander. Abe! I should be a Kosher? *Oi, weh iss mir!* At that, I think it's time we invented automatic steering, with a radio beam to keep cars in the proper lanes. So many drivers can't steer and talk at the same time, even when talking to themselves.

▲ ▲ ▲

Had to laugh at a postal sent out to the Detroit gang, signed by Clyde Hause and announcing the Moonlight, No. 1 is putting on. "Don't throw the card away," it reads. "Drop it on the floor so you will have to keep picking it up to remind you that August 15 is the Detroit Chapter MOONLIGHT." Okay, Clyde, we'll file as directed, and here's hoping we all meet at the MOONLIGHT.

Ed Dickett, who is Chairmaning the Membership Com'tee with the help of A.S.T.Eers Morganthall and Benedict, brought out some interesting points in the late Memberometer. Gosh, how The Society grows! Also, read a very interesting letter by Ray Morris, 2nd. V. P. who is doing a swell job. Ray sets forth a code of procedure toward guest speakers which, if followed out, will boost the prestige of The Society and foster that friendliness for which it has been noted. A fine thought, Ray.

▲ ▲ ▲

It seems that our boys are going to have a place to fight after all, the Lord and Secy. Knox willing. And Winston Churchill, who at first wanted only the tools, but now hints that a few operators might come in handy. Guess they'll be coming, old chap, being halfway there now, watching the cows eat herring in Iceland. The Western Hemisphere just grows and grows! Then there's Joe Stalin, who's had a change of heart since Mr. Hitler initiated a holy crusade against his godless commies. The devil a monk would be! Joe will probably call off defense strikes in the U. S. A. now that his *moujicks* are learning to sing Yankee Doodle and his own defenses are going *kaput*. Oh yes, Joe would gladly welcome the Polar Bears back to the Kola, which implies that the Dies Committee will turn off the heat the while Mme. Perkins converts Harry Bridges to the paths of conservatism.

For Il Duce, the blue waters of Mare Nostrum no longer mirror visions of empire nor dreams of a Caesarian reincarnation. *Quo vadis,* Muss? And down in Ethiope, the Ras is back under his parasol, one run ahead and content to muse on the "quintescence of beauty." So it goes. The Irish, emerging from economic nadir since they've become England's big butter and egg men, have finally decided to win the war for Britain. So that settles that.

Here in the States, we are told that we (the people) should breed and multiply, starting in the 'teens, all of which portends a long war. But careful!—that's how Muss & Hitler got that way.

(Continued on page 112)

Some Facts About Us

Our business is 25% ahead of the biggest year in the history of our company!

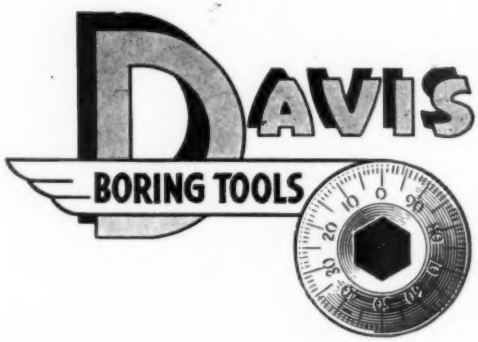
Now that sort of growth, brought about by the sudden heavy demands of National Defense, has naturally meant that we've had to inconvenience and disappoint some of our good friends and customers in matters of delivery. To say that we are sorry is true—but it does not deliver the needed tools.

Slowly but surely, however, we have been working out of this tremendous back log. We want to explain that we are steadily adding more skilled men in the shop, more engineers and tool designers, more floor space, more equipment of all kinds—and that we are gradually breaking through the jam.

To all you loyal customers we wish to express deep appreciation for the splendid cooperative spirit you have shown, and to assure you again that your orders will be taken care of as efficiently and promptly as this national emergency will permit.

DAVIS BORING TOOL DIVISION

Larkin Packer Co., Inc., St. Louis, U.S.A.



- We built a machine to simultaneously punish, batter and pound both faces of a Chicago Rawhide Hammer with crushing continuous blows.
- 10,000 times, two giant 25 lb. solid steel knurled-faced hammers dropping 19" at 45°, struck both faces simultaneously.
- The genuine Java Water Buffalo hide faces had *worn off* ⅛" (less than one-quarter of the usable insert) but still had a smooth, accurate striking surface.
- *Chicago Rawhide Hammers and Mallets which strike hard blows softly, without damage can take hard blows indefinitely without damage. Q. E. D.*

These economical long wearing tools are made in sizes and weights to meet every need. Insist on genuine Chicago Rawhide Hammers.

CHICAGO Rawhide MFG. CO.
1393 ELSTON AVE. ★ CHICAGO, ILLINOIS.

MORE SPEED LONGER LIFE with PUTNAM END MILLS

In an operation such as that illustrated —milling ⅜" slots in a die block— Putnam End Mills permit the maximum speed and feed. In addition, manufacturing and heat treating methods assure long, trouble-free service. Why not prove to your own satisfaction—by actual use on your machines—that the end mills which do "cut faster and last longer" are produced by Putnam?

PUTNAM TOOL COMPANY
2987 Charlevoix Ave. • Detroit, Michigan

They Asked Us... and We Showed Them..

How to Use the PORTER-CABLE WET-DRY Belt Grinders on SOME TOUGH PRODUCTION PROBLEMS

● ON DOUBLE-END wrenches, a foreman wanted to cut time on parallel-facing each end. G-8 did it, and also cleaned off enamel from the faces after dipping.

* * *

● *TO GET AWAY from milling operations, a maker of babbitt-lined bronze bearings asked us to face both edges of each half, so the bushings would fit together accurately and maintain a constant diameter along the bearing length. Porter-Cable G-8 did the job perfectly.*

* * *

● THE JOB on a plastic telephone base was to take off the flash and level the bottom. We demonstrated, and the wet-belt grinder was sold.

* * *

● *ANOTHER SHOP makes Catalin translucent radio cases. At the top of the mold, the plastic was rough and imperfect. All this was ground off by a Porter-Cable wet belt grinder without heating or discoloring. A smooth, perfect job.*

* * *

● AN INSTRUMENT manufacturer was puzzled about finishing a varying diameter tube. With the tube mounted on a mandrel, contact with the belt both rotated the piece and smoothed out the imperfections all around.

FREE TO PRODUCTION MEN. You owe it to yourself to know the facts about the Porter-Cable Wet-Dry Belt Grinder—how it supplements major machines, releases them for more important work—how it can be used for scores of operations on steel, aluminum, brass, alloys and plastics. The complete story is in a new book, "Wet-Dry Grinding in the Spotlight." Written by a Methods Engineer, it tells *where, when* and *how* to use this high-speed precision type of grinding. The most timely, helpful book in the machinery field. Send for your FREE copy *today*.

To Design Engineers: By designing parts so they can be machined and finished by this Wet-Dry Belt method, you often eliminate the cost of jigs and fixtures and save on set-up time.

PORTER-CABLE MACHINE CO.
1610 N. Salina St., Syracuse, N. Y.
Representatives in principal cities

IT'S NEW

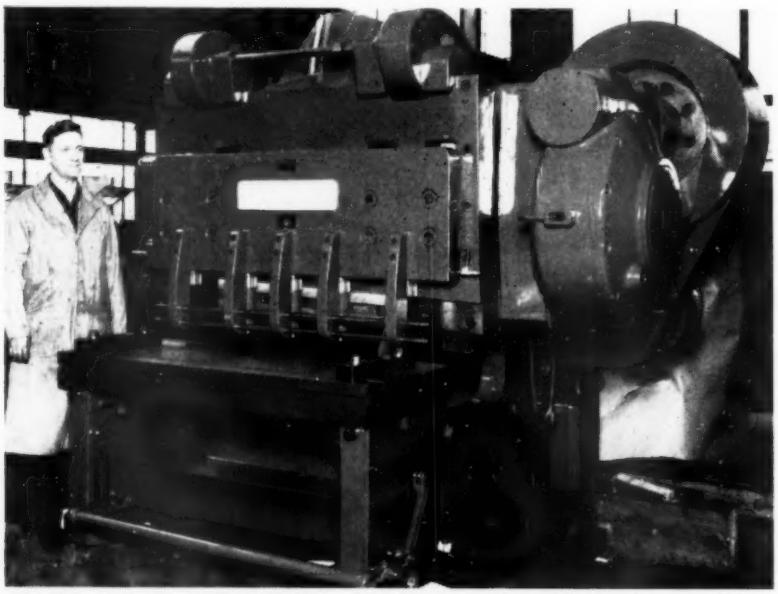
NEW EQUIPMENT – NEW MATERIALS – NEW PROCESSES

DETROIT POWER SCREW DRIVER (F3)

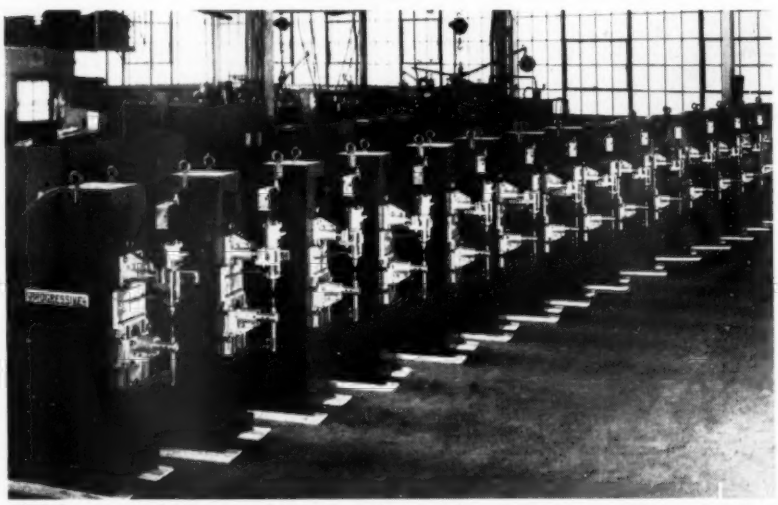
A new product has been added to the line of magazine feed power screwdrivers by the Detroit Power Screwdriver Company, 5373 Rohns Avenue, Detroit, Michigan. They have designed a new motorized hopper unit which is said to be unique in its construction, in that it is adaptable to hydraulic or crank presses, riveting machines, grinders and special machines.

These hoppers will feed screws, screw blanks, nuts, rivets, pins, plain washers and many various special parts that are adaptable to the hopper. They are made in three sizes, ten, twelve, and sixteen inch diameters and powered with a special one-tenth horse power ball bearing motor designed for constant service at 1725 rpm. Motor bearings are sealed in grease and hopper operating gears run in an oil bath which insures continued service with a minimum of care, it is said.

A special friction design of bevel gear is used to eliminate any damage to motor or gears should some foreign part get into hopper and jam or lock it. Two types of brackets for mounting hoppers are available which affords ease of adaptability to various types of machines. Small nuts, pins and washers are fed down the track as high as 500 pieces per minute and larger pieces in proportion, according to size and ease of pick up.



(F1) This 4 ft. x 1 in. Rolling Mill Shear built by the Cincinnati Shaper Company is one of several furnished to the Anaconda American Brass Company for continuous mill cutting of brass and zinc. Features include rolled steel plate construction, hydraulic holddowns, automatic lubrication, 30 strokes a minute. Net Weight, approximately 40,000 pounds.



(F2) To speed airplane production—a single order of resistance welding machines for an Eastern aircraft manufacturer, ready for shipment at the Detroit plant of Progressive Welder Company.

COLONIAL SINGLE RAM BROACHES (F4)

Increased size of work table and ram, and new streamlined design feature an improved standard line of Single Ram Broaching machines now being introduced by Colonial Broach Company, Detroit. Each machine is adapted to a wider range of tooling than formerly. Peak capacities have been increased to give ample reserve power when operating at normal rated capacities. Normal Capacities of the various sizes range from 3 tons and 36 inch stroke up to 25 tons and 66 inch stroke for the eleven standard models.

Column widths have been increased, permitting increased ram width on each of the machines which in turn provides better support for the wide bars frequently encountered in today's production requirements. In keeping with the increased width of the broach ram, the work platen has also been increased in width. The machines embody an entirely new cylinder design using seamless steel tubing in connection with welded construction for leak-proof operation. Another feature is the vertical

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date . . .

THREE FREE SERVICES . . . WITHOUT OBLIGATION

For your convenience, these three business reply cards enable you to request quickly . . .

1 New catalogs—bulletins listed in this issue.

2 Additional information or bulletins relative to new equipment—new materials or new processes.

3 When answering advertisements, specific information on problems or company representative's call.

HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail. Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described. In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

These Cards Not Good After Oct. 1, 1941

USE THIS CARD for requesting new catalogs and bulletins listed in this issue.

USE THIS CARD for requesting additional information or bulletins relative to new equipment, materials, processes, etc.

USE THIS CARD when answering advertisements, to obtain specific information on problems or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

NAME OF PRODUCT OR ADVERTISER

☐ Literature ☐ Have Representative Call

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

NAME OF PRODUCT OR ADVERTISER

☐ Literature ☐ Have Representative Ca

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

NAME OF PRODUCT OR ADVERTISER

☐ Literature ☐ Have Representative Call

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

NAME OF PRODUCT OR ADVERTISER

☐ Literature ☐ Have Representative Ca

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER

USE THESE *FREE* REPLY CARDS

They are provided for your convenience in requesting information and service . . . . .

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2c.-POSTAGE WILL BE PAID BY—

THE TOOL ENGINEER
THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICHIGAN

1

Request for:
NEW CATALOGS
BULLETINS
BOOKLETS

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2c.-POSTAGE WILL BE PAID BY—

THE TOOL ENGINEER
THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICHIGAN

2

Request for additional information and catalogs covering
NEW EQUIPMENT
MATERIALS
PROCESSES

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2c.-POSTAGE WILL BE PAID BY—

THE TOOL ENGINEER
THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICHIGAN

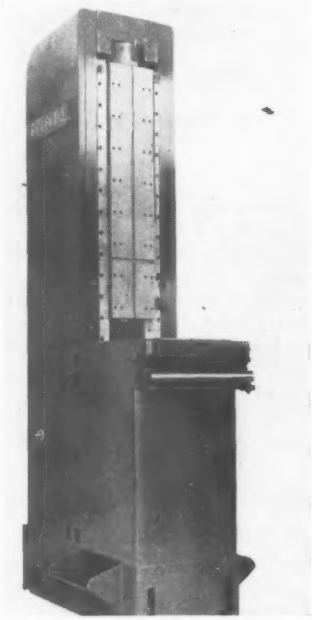
3

ANSWERING ADVERTISEMENTS
Requesting:
LITERATURE
REPRESENTATIVE TO CALL

mounting of the main drive motor inside the column, reducing the amount of floor space needed for installation.

Improvements simplifying the construction of the receding table mechanism allow for the effective installation of chip wipers, protecting the bearing surfaces of the moving platen. The new design of the table provides finish-machined pads on the front as well as on both sides for mounting auxiliary units such as cams, used to automatically operate clamps, locks and support jacks on the fixtures.

Increased chip room and coolant capacity are obtained in the new machines without increasing their overall



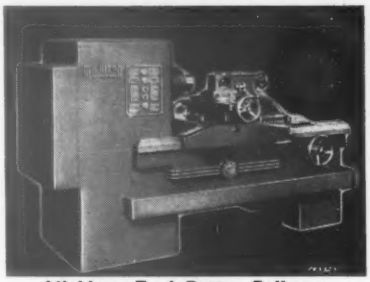
Colonial Single Ram Broach

height. All machines are equipped with heavy duty, large volume coolant pumps. Welded steel construction is utilized for the major parts such as the column and table. The increased use of steel castings in fabrication of the machines combines the flexibility of cast design with the inherent advantages of welded structures. For greater ease in installation, all machines are equipped with crane hooks at both top and bottom.

MICHIGAN TOOL CUTTER RELIEVER (F5)

Designed especially to simplify and speed the manufacture of rotary cutting tools of various types, a new universal cutter relieving machine has just been developed by the Michigan Tool Co., Detroit. The machine is said to be suitable for relieving form, gear and rack cutting tools, end milling cutters, spot facers, with radial or side relief or both.

Multiple range of forward and reverse speeds to handle virtually all forms of work at maximum efficiency is said to be a feature of the design. Other features include turntable for cam slide, permitting relieving from any angle; universal adjustable tool box for quick set-up; quick-interchangeable cams; lubrication from reservoirs with inspection portholes. The machine will han-



Michigan Tool Cutter Reliever

dle work up to 8 inches in diameter with

Solved..

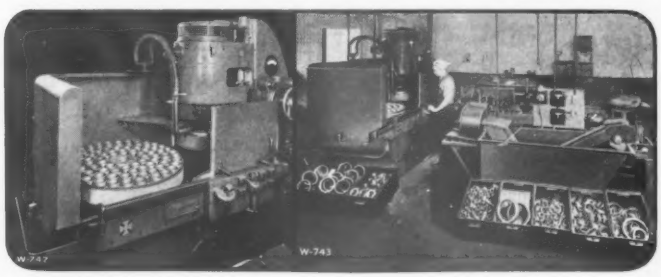
THE PROBLEM OF GRINDING A VARIETY OF SIZES — IN SMALL LOTS — AT A PROFIT!

When parts of various sizes are produced in lots not large enough to warrant the use of an automatic grinder—that's the place for a Blanchard No. 18 Surface Grinder. Note the wide variety of bearing races that are ground on the No. 18 shown below. The photo at the left shows 90 3⅜" diameter races on the magnetic chuck. 250 races (500 surfaces) are ground per hour to limits of ± .001" and parallel to .0003". Speed and accuracy are not the only points in favor of the Blanchard No. 18; a minimum of idle time between jobs is a further saving guaranteed by Blanchard design.

To further speed the handling of surface ground parts, this bearing manufacturer uses a Blanchard High Power Demagnetizer and a Blanchard Washing Attachment.

90 3⅜" races ground in one chucking

Hundreds of races—dozens of sizes



BLANCHARD

THE BLANCHARD MACHINE COMPANY

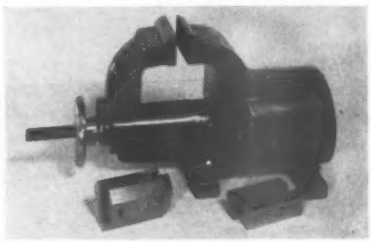
64 State St., Cambridge, Mass., U. S. A.

a maximum length between center of 24 inches. The number of teeth that can be relieved range from 1 to 24. Maximum relieving stroke is ¾ inch. Five relief cams are furnished with the machine. The speed changes, both forward and reverse, are obtained through electrical control. Two reversible motors are coupled in such a manner that by operating either one or both motors, seven spindle speeds—four forward and three reverse—are available at the touch of a control, while the machine is running.

FASTMATIC VISE (F6)

A new fast operating vise is announced by the Fastmatic Vise Co., Boston, Massachusetts. The jaws are mechanically operated in their closing and opening, reducing to a small fraction the time heretofore required on hand operated vises. Smooth and rapid jaw traverse is obtained by an oil or air pressure operated piston which is directly connected to the sliding jaw member. Holding power between the fixed and movable jaw is regulated by the pressure of piston. Air pressure at 80 to 100 lbs. is usually supplied from the air supply lines; oil pressure, from the pumps on individual machines or from independent hydraulic pumps.

While the movement of the piston in its cylinder is approximately one inch, various sizes of work are accommodated by setting the jaw in an initial position to the spacing desired by an adjusting screw located on the front end of the vise; for repetitive work, the



Fastmatic Vise

original initial setting is maintained, and the one inch movement in the opening and closing of the jaws is all that is required in inserting and removing the work.

Jaw operation is controlled by a conveniently located valve, which may be either hand or foot operated, although the latter is generally preferred, since it allows both hands to be free for handling operations, and thus further increases parts produced per hour.

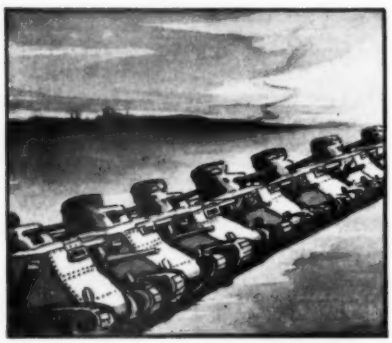
THOR RIVETING HAMMER (F7)

A new 3Z Thor extra light pneumatic Riveting Hammer is announced by the Independent Pneumatic Tool Co., 280 S. Jefferson Street, Chicago. This hammer is a slow hitting type hammer in which leakage and loss of power is said to be impossible because the air does not wipe across the large surfaces of the sleeve type valve, thus resulting in highly efficient operation and sustained uniformity of power over a long period. The riveter is said to feature lighter weight, combined with the proper speed and power to perform the driving of 5/32" Dural rivets in the assembling riveting on certain types of aircraft.

ILLINOIS GUN BROACHING (F8)

The speed and accuracy of the broaching method has for the first time been brought to the rifling machine gun and rifle barrels through the development of a new broaching system by the Illinois Tool Works, Chicago, Illinois. All the new elements for this new

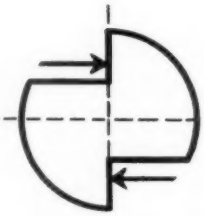
DRAW TH' LINE



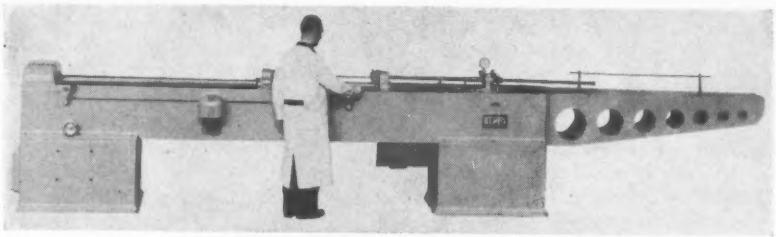
"Radial Drive" is a driving mechanism for small tools that applies energy on a line that passes directly through center.

Most important advantages—(1) less "machine—down" time; (2) faster, more accurate production. Now, draw th' line on inefficiency by specifying the most efficient design.

ECLIPSE COUNTERBORE COMPANY
DETROIT · MICHIGAN



RADIAL DRIVE



Illinois Gun Broaching Machine

broaching system were designed and manufactured under the supervision of Illinois Tool Works engineers, including broaches, broaching machines, broach sharpening machines and broach inspection fixtures.

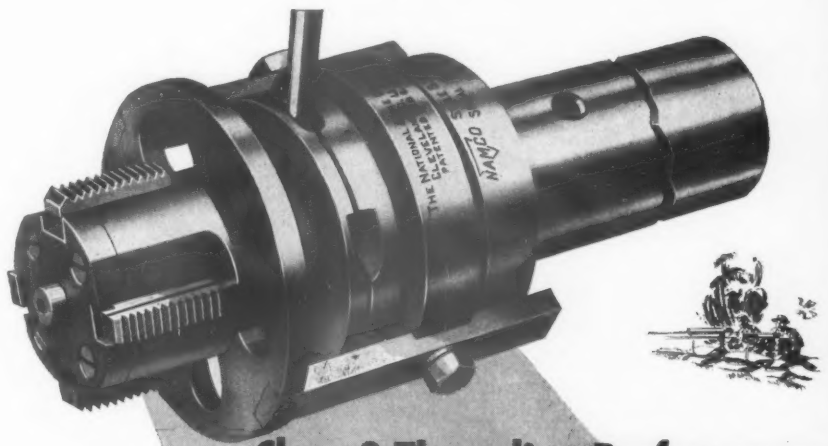
The Broaching Machine for rifling gun barrels is a screw type machine. The screw is driven through V-Belts by a reversible motor. The free floating, ball bearing jaw type puller contains a safety link which protects the broach against breakage. The by-pass valve of the high pressure coolant unit is set between 150 and 300 pounds per square inch, depending on the size and length of the barrel. All oil flows through a purolator unit in order to remain clean and even the smallest particles which might scratch the broach or barrel.

The principle of the rifling broach sharpening machine is similar to that of other broach sharpening machines. However, in adaptation to their specific duty they are equipped with special steady rests, interchangeable grinding and polishing spindles, and a diamond wheel dressing device. Radius dressing, grinding wheel diameter, spindle speeds and angular spindle adjustment all combine, it is said, to assure the best possible job of sharpening.

The rifling broach inspection fixture provides for visual inspection through a microscope of 20 magnification. The sizes and steps of the broached teeth are checked by a snap-gauge indicator arrangement. Visual inspection of the broaches determines if they have remained free from pick-up. Inspection follows every sharpening to ascertain that every trace of dullness has been removed. The job of sharpening must be checked on the diameters as well as on the face of the teeth. For face inspection, the broach is swiveled to a high angle position.

The broaches are pulled through the barrel and produce their own lead. No other device for turning besides a freely rotating puller is required. The cutting lubricant is supplied under high pressure. The pressure is built up in a chamber which is slipped up into the broach after it has been inserted into the barrel. Locked into position, the pressure chamber forces the lubricant over the broach and through the barrel. The construction of the broach facilitates the passage of large amounts of oil. Besides acting as a lubricant and coolant, the oil removes the chips from the cutting edges and accumulates them at the back of the preceding tooth. The ability of the broaches to follow their own lead is created by the sides of the broach teeth and by helical chip breakers in each tooth.

FOR YOUR CONVENIENCE
Use the Business Reply Cards In This Issue
SEE PAGE 95



Class 3 Threading Performance
Millions of Munitions Parts wi
Namco Standard Collapsing Ta

• **Bomb and shell production demand speed and MORE SPEED, but with never a let down on ACCURACY.**

Namco collapsing taps give that higher SPEED because they feature a sure and snappy collapsing action, are easy to adjust to precise cutting size, and have quick-removable chasers to save time when you stop for grinds.

They stay ACCURATE because of few parts, simple operation, heat-treated wear resisting construction and full length support of chasers directly in line with cutting pressure.

These are reasons why many mass producers of munitions standardize on Namco Collapsing Taps for their automatic and hand machines.

Ask us to show you these savings on any production tapping job where you need to make time and hold size. Capacities 1¼ to 7⅛".

NATIONAL ACME
170 EAST 131ST STREET • CLEVELAND, O.
ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

SELLERS 69 YEAR VETERAN (F9)

In the year 1872, a 24" double-housing planer embodying the spiral gear drive invented by William Sellers in 1864, was manufactured in the shops of William Sellers & Co., Inc., of Philadelphia. It was used in regular production from that time until 1923, the indication being that it was in active use during the Spanish-American War and in the production period before, during, and after the First World War. During the period following 1923, the records show little activity on the part of the planer.

In 1934, like many a man in his sixties, it was retired. Because of its historic interest it was placed on exhibition in the halls of the Franklin Institute, Philadelphia. Recently the directors of the Franklin Institute, which is no mere repository of records, offered to help the Government on the defense program by handling machine work in their own well-equipped shops. On a job requiring the planing of precision instruments parts, the old planer was thought of. So it was put into operation again and is now doing its daily shift as regularly as

Planer (top) at time of delivery in 1872, and today.

in the days of President Grant and as accurately as the close tolerances of the present day require, showing no signs of its almost 70 years, it is said.

CUNNINGHAM SHELL MARKER (F10)

A motor driven Shell Marker for marking around the circumference of rough forged or finished shells is announced by the M. E. Cunningham

Cunningham Shell Marker

Company, 169 E. Carson St., Pittsburgh, Pennsylvania. Made from steel

Boyar-Schultz

PROFILE GRINDERS

Provide Short Cuts in National Defense

Cutting the corners . . . finding better and quicker ways to increase National Defense production . . . that's where Boyar-Schultz Profile Grinders excel.

They shorten the time required for grinding irregular contours and profiles and odd shaped surfaces so often encountered in cams, dies, punches, templates and similar work.

Floor Model No. 2, shown at right is built for heavy and complicated work. With two independent, oscillating spindles, driven by separate motors, it is a truly versatile machine tool.

Write For Circular

BENCH MODEL No. 1

Recommended for fitting dies and punches, grinding die clearances, and other similar time consuming jobs.
High spindle speed of 20,000 R.P.M., with vertical oscillations of 100 per minute, assure efficient grinding.

Using the Upper Spindle for Grinding Inside Contour

Inside Contour Being Ground with the Lower Spindle

BOYAR-SCHULTZ CORPORATION

2116 Walnut Street, Chicago, Illinois

PRODUCTO Master & Standard DIE SETS

delivered promptly

Whether your need is in the East or the West, we can give you complete, quick service on Producto equipment.

Producto Die Sets are made in a wide variety of designs to meet the exacting demands of present day high production. There is one to fit exactly the die construction best suited to your stamping needs.

Write for Catalog No. 9

THE PRODUCTO MACHINE CO.
BRIDGEPORT, CONN.
and
3017 Medbury Ave., Detroit, Mich.

Also Die Supply Co., 1390 E. 30th St., Cleveland, Ohio. Pacific Coast users, contact Joseph C. Fletcher, San Francisco. Frey Industrial Supply Co., Los Angeles. General Tool Co., Portland, Ore.

DISTRIBUTORS OF DICKERMAN AUTOMATIC PRESS FEEDS

DOING MUCH RADIAL DRILLING?

New Hartford Super-Spacer Supplemental Base

● If you haven't a Hartford Super-Spacer in your shop—investigate, promptly, its many money and time saving advantages. If you already have it, then get the facts on this optional accessory, brand new, a real adjunct in many troublesome jobs—particularly where much radial drilling is being done. This new tool completes a wide range of jobs possible with the Super-Spacer, reduces set-up time to almost nothing, handles wide variations in both diameter and length.

Write for Further Details

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

Replace 3 operations cut labor units 75% ••• save steel ••• with CAMPBELL *Cutamatics*

● One fast, clean Cutamatic operation cut and finished these 1⅞" Tank Springs to exact length—to replace 3 operations that previously required 4 times the labor units and wasted steel at both ends.

Other Defense Jobs Cut on
CAMPBELL ABRASIVE CUTTING MACHINES

AIRCRAFT: Crankshafts, Valve Stock, Valve Tappet guides and pistons.

TANKS: Crankshafts, Springs.

MISCELLANEOUS: Gun Barrel and Machine Gun Stocks; Shell Tubing, Armor Plate (for tests), Forging Blanks.

CUT ON CAMPBELL NIBBLERS

AIRCRAFT: Sheet Stocks, Tubing, Gas and Oil Tanks.

ARMY: Motor Truck and Armored Truck Bodies, etc.

Write for booklet "Design for Cutting Costs." It may help you handle your cutting problems.

ANDREW C. CAMPBELL DIVISION
Bridgeport • Connecticut

In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.

plates to assure solid, sturdy construction with the minimum of weight it is made in either pedestal or bench models and is said to be easily installed into any inspection or production line because of small compact size.

Marking die is made to take either individual interchangeable type or solid stamp inserts. Both the die and inserts are constructed from safety steel to assure the maximum of service and safety. Marking die rotates continually, thereby eliminating need for clutch and speeding up production. A red and green colored plate on outside of rotation shaft indicated when die is in position to allow insertion of shell. Die is geared to stamp a maximum of 18 shells per minute.

DESPATCH TEMPERING FURNACE (F11)

The Despatch Oven Co., 622 Ninth Street, Minneapolis, Minn., offers an improved design in their CF furnace, which is said to make it more adaptable to tool room tempering and drawing work, to the heat treatment of aluminum rivets and other aluminum alloy castings and parts, to the preheating of aluminum billets before forging, to the heat treatment of magnesium alloy castings and to general production work requiring a temperature range from 300 to 1200 F.

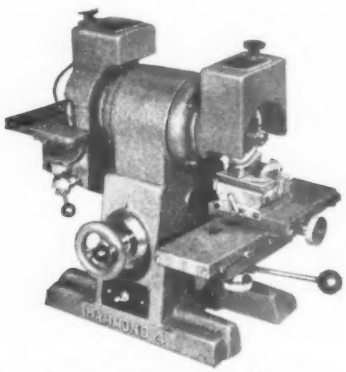
Body construction of the furnace has been made heavier, and heavy duty lift doors have replaced the former swing-type doors. Fan capacities have been

Despatch Tempering Furnace

increased, and the method of interior heat distribution and circulation modified to increase uniformity. The units are furnished with either gas-fired or electric heating systems.

HAMMOND CHIP-BREAKER GRINDER (F12)

A new machine for grinding chip-breaker grooves in carbide tools with a 4" peripheral diamond wheel has been placed on the market by Hammond Ma-



Hammond Chip-Breaker Grinder

chinery Builders, Inc., 1636 Douglas Avenue, Kalamazoo, Michigan.

The new tool vise featured by the machine provides three separate planes of

AMPCO

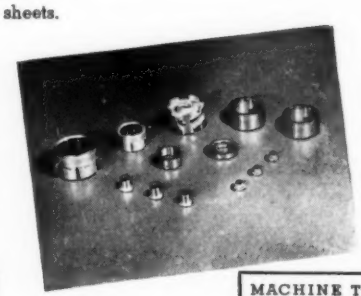
THE *Essential* BRONZE ALLOY in Defense Industries

In aircraft construction—in the machine tool industry—in countless items of equipment vital to the national defense program — AMPCO METAL is considered essential for parts subjected to severe stress, wear, impact or corrosion—wherever *"Metal Failure"* may be a problem.

This alloy of the aluminum bronze class is unique in its physical properties. There are six grades, with hardness to 352 Brinell, tensile strength to 105,000 lbs. per sq. in., compressive strength to 65,000.

Write for engineering data sheets.

AMPCO METAL, INC.
Dept. TE-8 Milwaukee, Wis.



AMPCO METAL
The Metal Without An Equal
AMPCO

MACHINE TOOLS . . . leading manufacturers standardize on AMPCO METAL because of its stubborn resistance to wear, "squashing out" on shock loads.

AIRCRAFT PARTS . . . a representative group of AMPCO-MADE aircraft parts, all precision machined by AMPCO.

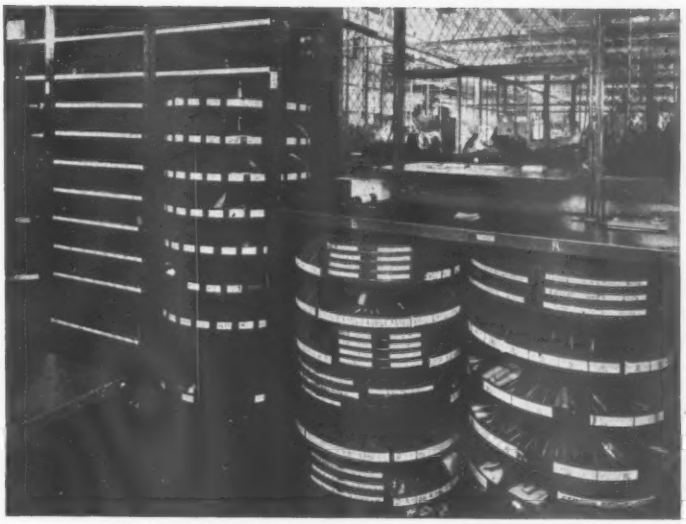
SAVE as HIGH as 50% FLOOR SPACE

in your tool and stock rooms

With greatly increased production — you are stocking many extra tools today. You want these tools *when you want them, and in a hurry.*

•

Save 50% of your present tool and stock room space easily, inexpensively and quickly with "ROTABIN" equipment.



"ROTABIN" stores all binable items in a compact space below eye-level, easily accessible, with systematic stock arrangements.

•

Now is the time to investigate "ROTABIN". There is no cost or obligation on your part. Write us today.

Send for New Catalog

THE FRICK-GALLAGHER COMPANY

WELLSTON, OHIO

ARMSTRONG

Uniform clean-cut knurling always

● Your knurling can be no better than your knurls and the tool that holds them. Standardize on ARMSTRONG Hobcut Knurls — the sharper deep cut, accurately formed patterns. Use them in the ARMSTRONG Knurling Tool which is automatically self-centering, which automatically equalizes pressure on knurls and "tracks" accurately. Knurls are held in a large knuckle joint that has strength to withstand tremendous side and end thrust. Write for Catalog C-39.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

360 N. Francisco Avenue — Chicago, U.S.A.

Eastern Warehouse & Sales: 199 Lafayette St., New York

Mark Iron, Steel and Carbides the

Etchograph

Way

•

2000 IN USE

NEW JUNIOR MODEL

Buy the Original Electric Etcher

Three sizes to meet all requirements. Also a combined Etchograph and Demagnetizer.

With New ELKONITE TIP Pencil

Mark hardened parts tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly.

Write for circulars and prices.

BREWSTER-SQUIRES COMPANY

54 Church Street

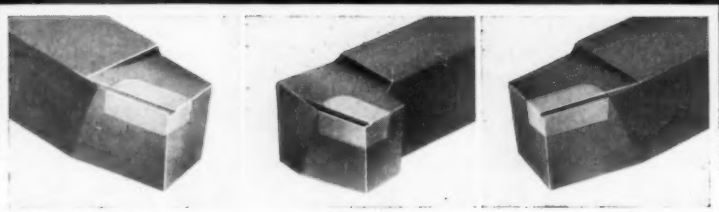
NEW YORK, N. Y. — U. S. A.

adjustment in setting the grinding angle. Each plane adjusts by means of accurately scaled readings. The vise consists of two closely machined steel blocks rounded on the bottom, cradled into each other at right angles and "frozen" together after adjustment by means of cam locks operating in machined segments located on ends of the respective blocks. Mounted atop these two blocks is a flat, circular piece which swivels 90 degrees from center of any of the four sides of the block below. This piece carries the vise jaws, holding tools firmly by means of Allen screws.

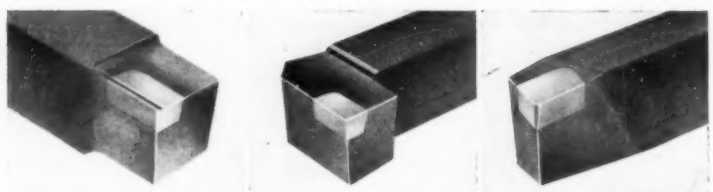
After the tool has been mounted in the vise, adjusted to the desired grinding angle and locked into a solid, non-deflecting block, the entire unit is cranked upward into contact with the grinding wheel by a few revolutions of the calibrated hand wheel at front of the machine.

The grinding assembly on the left side of the machine may be used for rough or finish grinding of carbide tools, using a 6" Silicon Carbide or Diamond Cup wheel mounted on the machine's left hand spindle. Over the wheel is mounted an integral wheel guard and coolant tank with needle valve. A tilting work table, slotted for protractor angle-guide and fitted with easily cleaned sludge pan underneath, is mounted on a heavy machined shaft extending from left side of the machine base. To change wheels, the entire unit may be slid easily off the supporting shaft by loosening one clamp.

STANDARD KENNAMETAL TOOLS LIKE THESE:



Style 12 Tool | Style 21 Tool | Style 11 Tool



Style 6 Tool | Style 9 Tool | Style 19 Tool

Are Releasing Machine Tools For U. S. Armament Production

How KENNAMETAL steel-cutting carbide tools release machines for the preparedness program is illustrated by the experience of a large concern machining steel gear blanks on three turret lathes. This manufacturer also wished to do his share for National Defense by accepting a shell turning contract. By adopting KENNAMETAL steel-cutting carbide tools—both for the gear blanks and for the shell turning—he was able to get required production without adding to the congestion of the machine tool market. Because KENNAMETAL reduced machining time on the gear blanks from 26 minutes to 3½ minutes, one machine was able to handle the work, while the other two machines were used for shell turning.

In many other places, KENNAMETAL tools have released machines for essential armament production without decreasing production of the manufacturer's regular line. If you are faced with a similar problem, it will pay you to investigate this modern steel-cutting carbide without delay.

Standard and Modified Standard KENNAMETAL tools are now shipped within 10 days of receipt of order; standard blanks within 3 to 4 days. On unusually large orders, partial shipments are made within the above times. Send for free Catalog.

CANADIAN AGENTS: Kennametal Tools and Mfg. Co., Ltd., 24 Dunbar Ave., Hamilton, Ont.

McKENNA METALS Co.
600 LLOYD AVE. LATROBE, PA.
FOREIGN REPRESENTATIVES: U. S. STEEL EXPORT CO
(Exclusive of Canada, Great Britain and Possessions)

VASCOLOY CARBIDE DIES (F13)

The largest cemented carbide dies believed ever to be manufactured were designed and built by Vascoloy-Ramet Corp., North Chicago, Illinois, for the cold nosing of 105 mm shells.

The work is done on conventional vertical mechanical presses, the shell being held in a fixture on the bed of the press while the die descends and performs the nosing operation. A production rate of 120 shells per hour per press is reported.

Cold nosing of shells ordinarily involves a problem of scoring, galling and pick-up which often results in a high rejection percentage and considerable die wear. The tantalum carbide content in Vascoloy-Ramet dies is said to overcome this problem by imparting a peculiar lubrication characteristic.

Vascoloy Carbide Dies

The die consists of a tantalum-tungsten carbide insert, the inside of which is finished to the contour of the shell, firmly mounted in a substantial steel casing. Examination of the dies after several weeks of operation shows no measurable die wear, and it is estimated that each die will nose several million shells.

AMERICAN FOUNDRY WHEELABRATOR (F14)

A Wheelabrator tumblast, an airless abrasive blast tumbling type cleaning machine, manufactured by The Ameri-

Model 100 - Self-Priming Vertical Mounting
Model 200 - Self-Priming Side Wall Bracket Mounting
Model 400 - Motor Feet Mounted
Model 500 - Submergable
Model 300 - Flange Mounted

Are Coolant Pumps Your BOTTLENECK?

... Buy BRADY - PENROD

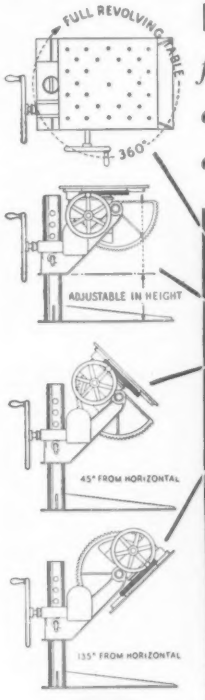
Keep production high with BRADY-PENROD Coolant and Circulatory Pumps - motor driven, open impeller, centrifugal type. If you get poor results from standard pumps, let us produce the special type you need for volume business. Our pumps have hydraulic efficiency as high as 70%. They are designed to eliminate wear on the pump; reliable for use with abrasives. Equal efficiency maintained, pumping water or light oil. All five models available with separate rating established at 400 SSU; 750 SSU; 1250 SSU; 2000 SSU.

⅛H.P. MOTOR REPLACES ¼H.P. - through superior pump design. All motors have 20% surplus power.

CAPACITIES: ½"to 2"pipe; 4 to 100 gallons per minute. Special models for larger capacities. Pressure up to 100 feet head.

FREE Send for Bulletin N-B541.

BRADY - PENROD, INC.
1216 W. Second St. MUNCIE, INDIANA.



FIND OUT HOW MUCH

faster, more economical and better welding you can do on a C-F Positioner

CULLEN-FRIESTEDT CO.,
1318 S. KILBOURN AVE. CHICAGO, ILLINOIS

Gentlemen: Please send me circular WP 20.

Name _____

Title _____

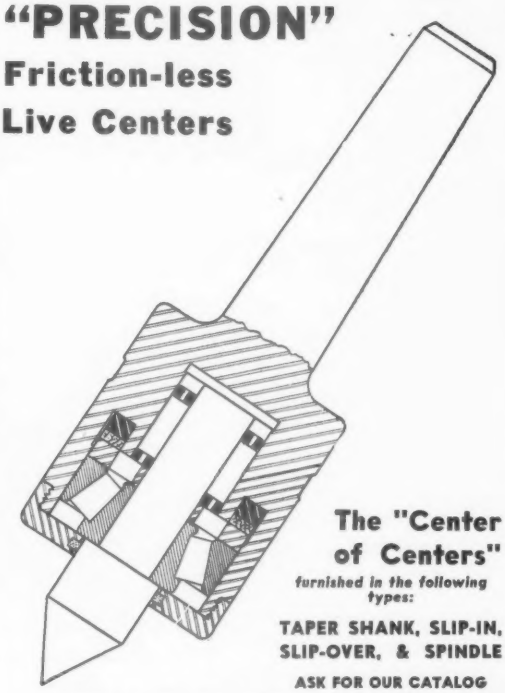
Address _____

_____

mail this coupon today

"PRECISION"

Friction-less Live Centers



The "Center of Centers"

furnished in the following types:

TAPER SHANK, SLIP-IN, SLIP-OVER, & SPINDLE

ASK FOR OUR CATALOG

THE J. C. GLENZER COMPANY

DETROIT MICHIGAN

can Foundry Equipment Company, Mishawaka, Indiana, has been installed for several years at the plant of The Burgess-Norton Mfg. Co., for removing the scale from the holes of piston pins.

This concern manufactures a great many piston pins for original equipment and the holes in the pins run from ¼" to 2" in diameter with a corresponding variation in outer diameters and lengths. The removal of scale from the holes in the pins had always given them difficulty and they had investigated various types of air sandblasting equipment, before installing the airless blast cleaner. In so doing it is claimed that they eliminated two expensive grinding and lapping operations, and also discovered another advantage which was equally as important as the purpose for which the machine was originally purchased.

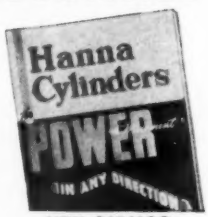
After the pins are cleaned in the Wheelabrator Tumblast, they are able to detect readily, any soft spotted condition—which condition is periodically prevalent in the making of piston pins since the great majority of them are made of low carbon steel, case hardened. These soft spots will appear clearly in relief on the surface after Wheelabrating, by reason of the steel grit abrasive roughing up the surface of the soft spots to a greater extent than the hard portion of the pin. This rougher surface gives the appearance of being a different shade of gray; thereby making the detection of the soft spots comparatively easy.

YOU CAN DEPEND ON TO SAFEGUARD MACHINE PRODUCTIVITY

BY utilizing Hanna Cylinders as integral parts of the machines you design, you can be sure that performance and productivity will be safeguarded throughout the life of every unit. Here, then, are "mechanical muscles" built to perform the thousand and one jobs that you may require—raising, lowering, pushing, pulling—all with equal force, smoothness and speed and with a minimum of attention.

Hanna Cylinders have replaced manual effort in scores of operations—they have simplified all types of machine control and actuation. Results are continually demonstrating their economy. There is a standard Hanna Cylinder, air or hydraulic, for your application. Put them to work.

HANNA ENGINEERING WORKS
1765 Elston Ave., Chicago, Ill.



NEW CATALOG
The new Hanna Cylinder Catalog No. 230 is replete with illustrations, dimensions, capacities and valuable engineering data to help you select the correct cylinder or control valve for every application. Available to executives and engineers requesting it on company letterheads. Send for your copy today.

Hanna Cylinders
AIR • HYDRAULIC

An Important New SERVICE is offered to readers of THE TOOL ENGINEER starting this month

See Page 95 for details!

SHERWIN-WILLIAMS CASTING ENAMEL (F15)

A new and faster synthetic enamel for machine tool castings is announced by the Sherwin-Williams Co., Cleveland. Known as Kem Machine Tool Enamel, the new finish is said to cut many hours

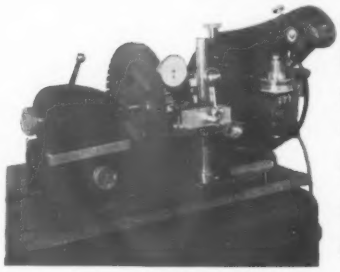
and even days from the finishing time formerly required on large tools and is said to give far greater resistance to cutting compounds.

Compared with the oil enamel method, which is said to require from a day and a half to four days, the new Kem finishes can be applied in 5¾ to 8½ hours, four coats, thus permitting work to be shipped the same day it is finished and assembled. A typical drying schedule follows:

		Drying Time
First:	Spray or brush coat Zinc Chromate Primer	15 to 30 min.
Second:	Machine Filler	4 to 5 hours
Third:	Kem Sealer Gray	15 to 30 min.
Fourth:	Kem Machine Tool Gray	15 to 30 min.
	Dry and Crated	1 to 2 hours
	TOTAL	5¾ to 8½ hrs.

The illustration shows a typical machine tool casting, in its original form on the right and finished with Kem Machine Tool Enamel, four coats, on the left.

For EXTREMELY ACCURATE FINAL INSPECTION



of SPACING, ANGULAR LOCATIONS or SIMILAR CHARACTERISTICS of GEAR TEETH, MASTER INDEX PLATES, SPLINES, Etc.

Illustrated is the Vinco Dividing Head used for the inspection of a master index plate, twelve inches in diameter with notches spaced to within .0001" accumulative error irrespective of the number of notches.

This is the only instrument which provides such an accurate check of parts such as this. Only by the use of complicated and cumbersome equipment can its function be even partially duplicated. Write for full information on how it can be used to excellent advantage in your plant.

VINCO Optical Master Inspection DIVIDING HEAD

VINCO Corporation
9115 SCHAEFER HIGHWAY DETROIT, MICHIGAN

because RED-E Centers have high speed steel ends. Thus they give longer life at high speeds. They make for increased output and reduce time required for grinding points.

Write for Catalog E-41

THE READY TOOL COMPANY
585 IRANISTAN AVE. BRIDGEPORT, CONN.

New Convenient Drill Grinding Combination

•

Sellers No. 1G Drill Grinder with steel cabinet pedestal

A firm, substantial pedestal for the grinder and the work, and a handy cabinet in which to store supplies and attachments. Cabinet and grinder may be purchased separately, if desired.

The Sellers Model 1G Drill Grinder will grind drills from No. 70 (.028") to ½" and produces accurate drill points of 160 to 65 degrees included angle — perfect drill points with equal identical lips. Speeds production. Saves skilled labor for production machine work. Saves drills. Write for catalog and prices.

WILLIAM SELLERS & CO., INCORPORATED
1626 Hamilton St., Philadelphia, Pa.

Sellers

Reclinable POWER PRESSES

This press has long been considered the most suitable and favored type for general stamping work. Its features have been standard for a number of years, but many important improvements in details make the latest model outstanding. Its high performance is the result of thorough research, sound engineering and careful designing.

The Type 36 Press is available either plain or back geared, and the models range from 4 to 100 tons capacity.

Complete information on this and other Z & H presses will be sent on request.

ZEH & HAHNEMANN CO.
192 VANDERPOOL STREET, NEWARK, N. J.

New Literature

Of Interest to the Tool Engineer

Screw Machines

Set-Up and Operation of Brown & Sharpe Automatic Screw Machines. 240 pp. $.50. Brown & Sharpe Mfg. Co., Providence, R. I. This series of 14 booklets to aid beginners in screw machine operation contains general operating descriptions and useful tables for Nos. 00, 0, and 2 sizes of Automatic Screw Machines as well as helpful hints and full instructions for sharpening and adjusting all the commonly used tools. Twelve typical screw machine jobs are covered. Being in booklet form, the series is readily adapted to lecture or school use, and a "Teaching Kit" is offered with orders for twelve or more sets of booklets.

(228) Gas Appliances

Johnson Gas Appliances. Johnson Gas Appliance Co., Cedar Rapids, Iowa. This catalog illustrates and describes their entire line of burners, furnaces, torches, mixers, valves, and blowers. Also included is a chart showing correct carburizing and heat-treating temperatures and a heat color chart.

(229) Collets

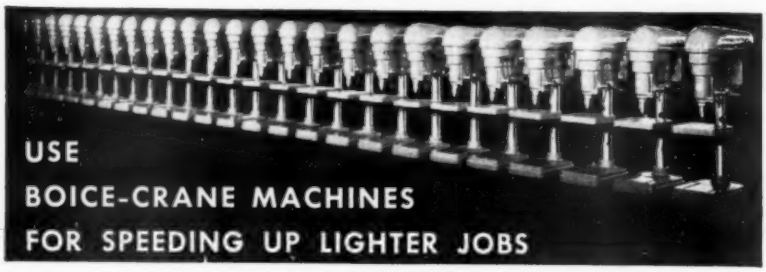
Draw-In Collets for all Lathes and Millers. 4 pp. Hardinge Brothers, Inc., Elmira, New York. This folder gives complete up-to-date information on the correct collet adaptation for the different makes of lathes and milling machines. The proper name for each type of Collet, the maximum round, square, and hexagon capacities, the major dimensions for identification purposes and prices are clearly presented in the bulletin.

(230) Ball Bearings

New Departure Hand Book, 15th Edition. 156 pp. New Departure, Division of General Motors Corp., Bristol, Connecticut. This handbook lists the principal types and sizes of the forged steel ball bearings, and includes dimensions, capacities, tolerances, and mounting fits, as well as new data to simplify the selection of bearings for various loads and length of service.

(231) Boring Mill

Horizontal Boring Mills. 6 pp. The Yoder Sales Co., Cleveland. This folder explains changes and improvements in design and gives illustrations, description, and specifications of the new Yoder Boring Mill.



Write Today **FOR THESE 2 FOLDERS ON THIS DELIVERABLE PLANT EQUIPMENT**

Dependable delivery on Boice-Crane tools—often only a matter of days—never over a few weeks. Why wait 6 to 12 long months for big, heavy, costly tools that never can handle light jobs as efficiently anyway? Oughtn't you get our literature too and start tooling more light drilling, tapping, and cutting jobs this quicker, cheaper way?

Folder No. 1 lists over 60 Boice-Crane Drill Presses to 5/8" and Tappers to 1/2" capacity. No. 2 covers our 8-speed All-Purpose Band Saws.

They Tell You How To Keep Your Big Machines Free For Big Work

The most logical thing in today's forced production is to use your large, hard-to-replace machines on large operations **only.** Load the smaller jobs on lighter, speedier, less costly AND easier-to-get Boice-Cranes, and the benefits double up. Get more out of your big machine—and the EXTRA saving of running the lighter jobs at reduced cost on a machine designed specially for that class of work.

The Boice-Crane 8-Speed Band Saw Cuts Everything

The new Boice-Crane is the perfect small band saw for production, tools, dies, foundry and experimental work. 8 speeds cut many materials. Powerful gear drive.

***Write Today*—FOR FOLDERS AND CATALOG**

BOICE-CRANE COMPANY NORWOOD AVE. TOLEDO, OHIO

HOW TO ORDER

Booklets listed in this department and identified by a key number preceding the heading may be obtained by using the postcard on page 95. No postage is required.

(232) Power Tools

Black & Decker Data Book on Power Assembly Tools. 56 pp. The Black & Decker Mfg. Co., Towson, Maryland. This data book contains information on portable electric screw drivers, nut runners and tappers, and information as to sizes of pilot holes, bolt, nut, cap screw and lag screw sizes, socket wrenches, tap drill sizes.

(233) Hack Saws

Metal Cutting. 20 pp. Clemson Brothers, Inc., Middletown, New York. This booklet contains suggestions for proper selection and use of hand and power hack saw blades and flexible band saw blades.

(234) Munitions Cleaning

Munitions Cleaning Handbook. 36 pp. Magnus Chemical Co., Inc., Garwood, New Jersey. This handbook discusses in detail the cleaning problems met with in modern munition production. It covers cleaning operations in the manufacture of shells, shell cases,

SIMPLIFIED INTERNAL GRINDING with the MAJESTIC INTERNAL GRINDER

An exceptionally wide range of internal grinding jobs can be handled on the New Majestic Internal Grinder. Its simplicity of design and ease of operation are features of utmost importance in providing maximum grinding output at low cost.

SPECIFICATIONS

Length of table, 48". Swing over table, 10". Travel of cross slide, 2½". Precision dial graduated to .0001". Precision bearing work head. Speeds—100, 225, 350 r.p.m.

Write for complete details contained in New Bulletin

Majestic Tool & Mfg. Co.
2950 E. Woodbridge Detroit, Mich.

SHELL MARKING MACHINE

Marks from 10 to 40 Shells Per Minute

Designed for high speed marking, the No. 79 Machine is made in five sizes . . . for marking shells from 1 to 6" in diameter. Aside from the feed ways, the machine is entirely automatic . . . It selects, marks and ejects shells. Marking dies or type holders are quickly changed for various marking. Write for full information and prices.

MODEL 79

MACHINE SPECIFICATIONS

Size: 45" high, 30" wide and 40" deep. Weight: Approximately 1,500 lbs. Capacity: 10 to 40 shells per minute. Motor: ¾ H.P. Write today.

JAS. H. MATTHEWS & CO.
3945 FORBES ST. ∴ PITTSBURGH, PA.
New York—Chicago—Phila.—Boston—Detroit—Newark—Syracuse

DISTRICT SALES OFFICES - CLEVELAND - HARTFORD - BIRMINGHAM

Save Up to 2½ PRODUCTION HOURS

Get 2300° F. in 30 Minutes

JOHNSON
No. 120 Hi-Speed Furnace

Every hour you can save in production time means a saving also in man-hours! Johnson Furnaces give you maximum heat in minimum time. They are lined with the finest insulating refractory, and the correct placement of the burners means a saving up to one-half in gas consumption, over that required by ordinary furnaces. You can make and save more money with a Johnson. No. 120 Furnace gives speedy, clean heating of all types of steel, high speed steel and high carbon steels. Also exceptionally efficient for hardening dies, punches and tools. Complete with G.E. Motor and Johnson Blower, Pedestal style **$129.50**

FREE New Catalog of Johnson Gas Appliances. Send for Yours TODAY!

All Prices Subject To Change without Notice

Our 40th ANNIVERSARY YEAR

JOHNSON GAS APPLIANCES FOR EVERY INDUSTRIAL PURPOSE

JOHNSON GAS APPLIANCE COMPANY
603 E Ave. NW.
Cedar Rapids Iowa

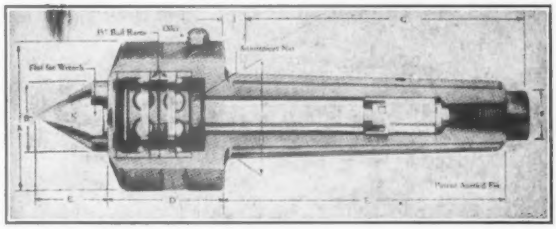
The Improved Nielsen Live Centers

LOAD CAPACITY—200 TO 40,000 LBS. AT 100 RPM.

HAVE ADJUSTMENT TO TAKE UP WEAR AND PRELOAD BEARINGS

STANDARD MORSE TAPER No. 2 TO 6 IN STOCK

WRITE FOR CATALOGUE AND DISCOUNTS



NIELSEN, INCORPORATED

LAWTON, MICHIGAN

small arms ammunition and fuses and fuse parts. Another section of it covers the cleaning operations required in the production of ordnance, transportation equipment and other material which must be built to meet the complex and extensive demands of the Defense Program.

(235) Filtration

Durex Presents Porex. 6 pp. Moraine Products Division, General Motors Corporation, Dayton, Ohio. A new class of products produced by powder metallurgy, called Porex and having application in any equipment or process involving the flow of fluids is described in this folder. Sample uses are filtering, diffusing, separating, flame arresting, and special applications.

(236) Elevating Tables

Lyon Trucks with Hydraulic Elevating Tables. 6 pp. Lyon Iron Works, 771 Madison St., Greene, New York. This folder describes and gives the specification of the Lyon trucks which are equipped with hydraulic tables for elevating the loads.

(237) Lift Trucks

Lyon Hydraulic Lift Trucks. 4 pp. Lyon Iron Works, 829 Madison St., Greene, New York. This folder describes and gives the specifications of the Lyon Hydraulic Lift Trucks.

(238) Steel Tubing

Engineering Data On Electric Resistance Welded Steel Tubing. Chart. Steel & Tubes Division, Republic Steel Corp., Cleveland. This chart contains a useful compilation of electric resistance welded tube data on sizes, tolerances, weights per foot, chemical analyses and physical properties of round tubing and also squares and rectangles.

(239) Hack Saws

Metal Cutting. 20 pp. Victor Saw Works, Middletown, New York. This booklet contains suggestions and hints for proper selection and use of hand and power hack saw blades and flexible back band saws.

(240) Grinding Compounds

Oakite Cutting & Grinding Compounds. 20 pp. Oakite Products, Inc., 57 Thames Street, New York. This booklet reviews 53 different formulas for machining ferrous and non-ferrous metals with specially designed Oakite cutting lubricants and grinding coolants. The formulas cover a wide range of machining operations.

(241) Chains

Taylor Made Products. 28 pp. S. G. Taylor Chain Co., Hammond, Indiana. This catalog illustrates and describes many types and grades of chain made by the manufacturer. It also gives data relating to proof tests, chain terminology and table illustrating safe loads for chains and slings.

(242) Bearings

Selflube Porous Bearings. 24 pp. Keystone Carbon Co., Inc., Saint Marys, Pennsylvania. This catalog describes the properties and uses of these self-lubricating bearings and furnishes complete details on the correct method of installation. Standard sizes for plain bearings, flanged bearings, and thrust bearings, are listed. There are graphs showing the allowance for press fit into housing, and the allowance for running fit after installation.

(243) Clamping Fixtures

Knu-Vise Toggle Action Clamping Fixtures. 24 pp. Knu-Vise, Inc., Detroit. This catalog features 22 different models of clamps, pliers, plier-parallels, "C" clamps, riveters and drill fixtures.

(244) Belting

Multicord Belting. 2 pp. The B. F. Goodrich Company, Akron, Ohio. This catalog section discusses construction and advantages of this type belt, including the application of the Plylock splice. Tables of minimum pulley diameters and approximate weights are included.

(245) Hydraulic Hose

High Pressure Hydraulic Control

30th ★ 1911 Anniversary
Atlas
DEFENSE LESSON NO.3
See first if the job can be handled by an Atlas Machine Tool to save larger machines for large part work. Atlas F-Series 10" Lathes are one of several Atlas Tools that are making important contributions to the production speed of the defense program.
When the nation returns to a peace time economy, Atlas production savings will help many plants open up the new markets that will be so vitally needed.
ATLAS PRESS COMPANY
814 N. Pitcher St.
Kalamazoo, Mich.
LATHES • DRILL PRESSES • ARBOR PRESSES
SHAPERS • VISES • MOTORS
Atlas
ATLAS PRESS CO.
KALAMAZOO, MICH.
U. S. A.

LITERATURE

Hose. 2 pp. B. F. Goodrich Co., Akron, Ohio. This catalog section describes the functions of hydraulic control hose, uses of the product, and description of manufacturing features. Commonly used and special sizes are listed in tables, as well as couplings, spring guards and adapter unions.

(246) Cutting Oils

Aladdin Had Something There. 4 pp. Fiske Brothers Refining Co., Newark, New Jersey. This folder describes and gives the features of a variety of Fiske's Cutting Oils.

(247) Tool Steels

Manual on Tool Steel. Allegheny Ludlum Steel Corporation, Pittsburgh, Pennsylvania. This manual is of special interest to students and instructors in trade and engineering schools, Army and Navy Courses, and industrial defense work. The data contained is sufficiently elemental to give students a clear picture of the analyses, treatment and basic uses of the alloys discussed, but is also inclusive enough to be of value to anyone who works with or uses special steels.

NEW BOOKS

Drilling and Grinding by E. Molloy. 104 pp. $2.00. Chemical Publishing Co., Inc. 234 King Street, Brooklyn, New York. The first chapter of this book sets down quite clearly the methods of reading the micrometer and the vernier Caliper—information which it is essential for the operator to have. With 92 illustrations, and a useful table of speeds and feeds, the book covers the subject of drills and drilling, grinding and grinding machines and centerless grinding. Special attention has been devoted to the question of selection of the correct grade of grinding wheels, and also fixing the grinding speeds for different types of work. Both surface grinding and cylindrical grinding—external and internal—have been covered.

Successful Shop Management. 204 pp. The Industrial Press, New York. This book is a review of the most important elements in the management of a machine shop or manufacturing plant, and includes specific data, methods, systems and principles which are essential to efficient and profitable operation.

Use the Convenient

Business Reply Cards

in this Issue

See Page 95!

AIRCRAFT RIVET HOLES BY THE MILLIONS
ARE BEING PUNCHED WITH
WALES PATENTED
SELF CONTAINED DIES

AT
BELL
BOEING
BREWSTER
CONSOLIDATED
CURTISS-WRIGHT
DOUGLAS
LOCKHEED
McDONNELL
MURRAY
NORTHROP
REPUBLIC
ROHR
STEARMAN
VEGA

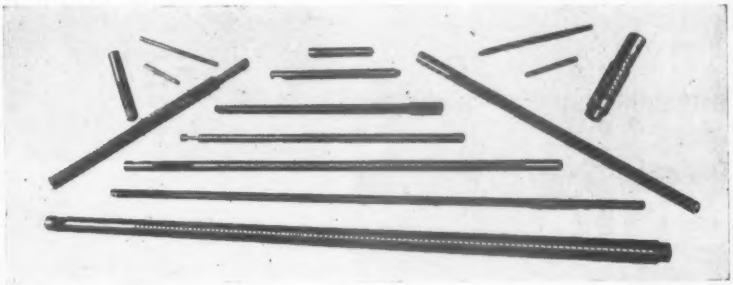
THERE MUST BE A REASON!

FOR FURTHER INFORMATION WRITE
THE STRIPPIT CORP. 1200 NIAGARA ST., BUFFALO, N. Y.

YOU CAN'T MISS
Top Production
WITH
AMERICAN

If you are engaged in National Defense work let "AMERICAN" help you hit top production. By producing finer broaching machines and tools than ever before we have been able to save precious time on machining operations and assure steady high production.

Let "AMERICAN" help you reach top production—and AT A SAVING.



AMERICAN BROACH & MACHINE CO.
ANN ARBOR, MICHIGAN, U.S.A.

(Continued from page 92)

And, our late leader of the "strong opposition" is back in the fold, an ardent second for the title holder. Say, if I ever vote the G. O. P. ticket again it won't be for a reneg—uh, I mean, they ought to draft Norman Thomas, just changing the label. But maybe I'll switch, too, and go New Deal. Roosevelt forever! Might as well, the Prex having his own way anyway and having done about everything everybody expected of him, including his political enemies. Well, that's that, and all in fun. Thought I'd try my hand at some snappy commentating, by way of diversion. Bill Hearst please notice.

▲ ▲ ▲

Me, I'd like to know what it's all about. Not that I'm pacifying, but just puzzled, like most of the common people. What are we going to defend, outside of resisting retaliation because of alignment and overt commission? Oh, let's be honest about these things! It makes no difference in the final analysis; right or wrong, our Country. But are we to defend our way of living? It's all being changed. Democracy, then? But we're poised at the Rubicon. Our farmers burn wheat in protest against regimentation, and our individual liberties (as the inherent right to labor) are being restricted by minority dictatorships. American labor has been sold into bondage, the production of tools vital to the very defense of democracy has been subordinated to piddling jurisdictional issues, and one protests these things only at risk of being smeared a copperhead.

Are we to defend our economic system? But that, too, is changing, while the enemy alleges economic stricture as a cause for war. War!—at what price? There has already been expended, on war, enough wealth to have insured the economic salvation of all mankind, without counting the economic value of millions of lives nor the incalculable deficits piled up in waste and property damage. Nor considering physical and spiritual degeneration, as peoples succumb to apathy and despair and growing children become warped in body and mind from malnutrition. What grand edifice can civilization rear, on the ashes of ruin, to compensate for political blundering and negative diplomacy?

▲ ▲ ▲

Are we to defend the Jews, generally unpopular yet persecuted out of all proportion to their imputed sins by the Nazi regime? Well, I would personally defend their rights as human beings, for once we create racial and class divisions Democracy is dead. You see that, speaking for myself, I am not without prejudice: I merely try to rise above it. Well then, are we to defend Christendom? But there are alleged pagans among our Allies, and Christians fight side by side with unbelievers in the hosts of the enemy. What are they defending?—if they know. And believer or infidel, Who would differentiate between them, in the final agony before Lethe? The unknown dead, each fallen in a cause perhaps beyond his ken, have the answer locked in their breasts.

Or, are we to defend Britain? If so, well and good!—we must keep our word, nor grudge the keeping. But England's Mr. Bevin tells us that, win, lose or draw, the British are due for social and economic reforms that will quite obsolete the present system. Strange, what? The Britons fight for ideals, for an ideology of freedom that we share, but also for the right to effect changes that they now resist from without. I ask, what is it all about? For somehow, the entire pattern lacks coherent design.

▲ ▲ ▲

Oh, these are embarrassing questions, but they are being asked, even if but in inner communion. And, with variations,

TIMELY Suggestions

. . . for chuck users. Published by the Cushman Chuck Company in the interest of better service during the National Defense emergency.

EVERY SPINDLE NOSE SHOULD HAVE ITS "HANDKERCHIEF"

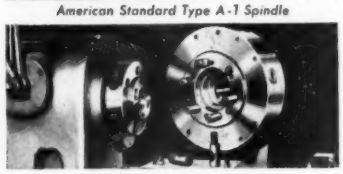
NO, we're not trying to be funny! This is something of importance to every metal working plant busy on defense production.

A chuck spindle nose is, of course, a highly finished and extremely accurate piece of equipment. Particularly is this true of the new American Standard, Cam Lock and Long Taper Key Drive Spindles. The accuracy of seating of the chuck . . . and hence the accuracy of the machine tool itself . . . depends upon the maintenance of the seating surface in perfect condition.

You'd be surprised how many chucks and spindles we have seen where dirt or chips have been forced between the bearing surfaces to cause damage and misalignment. That's why we say that every spindle nose should have its "handkerchief". A little extra care in wiping off spindle noses and chuck seating surfaces will prevent fitting troubles . . . and more important still . . . will make your vital chuck equipment last you longer and serve you better.

Remember, the Cushman Engineering Department is today, as in the past, anxious to be of assistance to you in solving your work-holding problems. Write us.

American Standard Type A-1 Spindle



Cam Lock Type D-1 Spindle

CUSHMAN CHUCKS

A WORLD STANDARD FOR PRECISION

CALL YOUR INDUSTRIAL DISTRIBUTOR

THE CUSHMAN CHUCK CO.
HARTFORD, - - - CONN.

OSTER

MAKES PIPE *and* BOLT THREADERS · HAND SCREW MACHINES
A TOOL OR MACHINE *for* PRACTICALLY *Every* REQUIREMENT

WRITE FOR NEW 1941 CATALOG OR TELL US YOUR PROBLEMS
AND WE'LL GLADLY DISCUSS THEM WITH YOU

THE OSTER MANUFACTURING CO., 2063 E. 61st ST., *Cleveland, Ohio*

they are being asked by all of the common people in all of the lands now locked in a death struggle. What is the answer? What can we defend, that will not need the defending again? Only this: an ideal, a principle so high that all peoples must subscribe to it, if for no other reason than that through it, alone, may be achieved their own material and spiritual salvation. Let us lay down a design for living that all men can live by, a code of ethics that all can respect, and a covenant of freedom acceptable to all but the anti-social, and the symptom which is war will be wiped out with the causes. But before that plan can be drawn, we must first rise above our prejudices. In the meanwhile, we'll fight, defending that which we are told we are defending. Yet, in time of war, let us prepare for Peace.

Small Tool Shortage

To the Editor:

The article on Small Tool Shortage (Tool Engineer, July, p 53) by President Frank W. Curtis is indeed a timely one.

In addition to our regular line, which is weaving machinery, we are also doing a tremendous amount of Defense work, not only making parts for the machine tool industry but also direct for the Navy.

In spite of a very efficient system for handling and ordering tools, we find that we frequently run out of certain sizes and it is discouraging to say the least to be told that we would have to wait six months for new tools. At the present time we find it difficult to get common tools such as hack saws, drills, taps, milling cutters, etc. As far as special tools are concerned, we try to make these ourselves so as not to embarrass the small tool manufacturers.

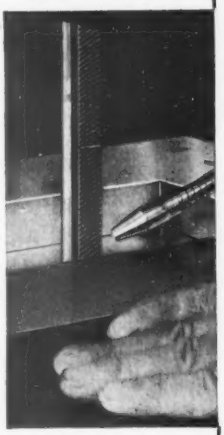
Perhaps some form of resolution signed by all the A. S. T. E. Chapter chairmen would help to call to Washington's attention that there is an acute shortage on small tools.

JOHN LINDEGREN
Crompton & Knowles Loom Works
Worcester, Mass.

Do others feel as Reader Lindegren does about the small tool shortage? We will be interested in hearing views and reports about the scarcity of small tools and will pass any suggestions along to the proper authorities in Washington. —Ed.

DoAll BAND FILES
Get Hard Jobs Done
FASTER BETTER SMOOTHER

Yes Sir — actual performance records prove that these modern files are 8 times as fast as hand filing —5 times as fast as jig filing. And today, time is all important.



Each file segment is automatically locked into one rigid, continuous file before it reaches point of work.

SEE HOW DoAll File Bands WORK

STOP FILE BOTTLENECKS

Don't let slow filing methods tie up your production. With DoAll Band Files you can do ***difficult internal or external filing***—finish special tools, molds and dies for your own plant use in 1/5th to 1/8th the time it takes to jig file or hand file them. Also, you can complete orders in record time.

WIDE RANGE OF SIZES AND STYLES

DoAll Band Files come in 3 widths, 23 styles, cuts and sizes—Files to cut everything from hardest high carbon steel to brass and plastics.

Send for Literature Today

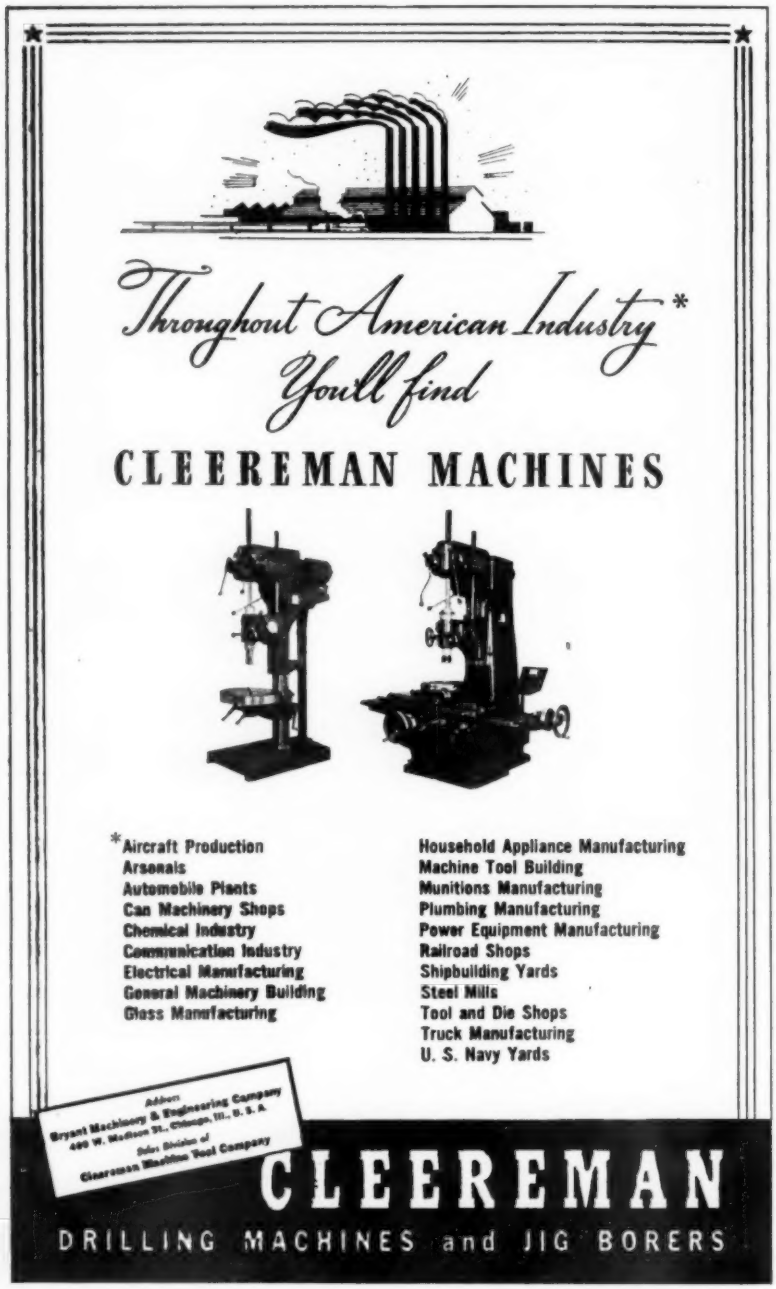
THE DOALL COMPANY, INC.
1211 Thacker St. Des Plaines, Ill.
Associated with Continental Machines, Inc., Minneapolis, Minn.

» » A.S.T.E. DOINGS « «

By IRWIN F. HOLLAND

Boston

The last spring meeting of the Boston Chapter was held June 12 at Eastman Bldg., M.I.T. preceded by dinner at Walker Memorial. Mr. H. M. Richardson, Chief Engineer of Development and in charge of Research of the Plastics Division of General Electric Company gave a most interesting talk on Plastics. Since publication of the 1940-41 Roster of Boston Chapter, 45 new members have been welcomed into the Chapter. By February a total membership of 300 is expected.



Detroit

June 12, Detroit Chapter No. 1 had one of the most interesting meetings of the year. It is always refreshing to a Tool Engineer to get an insight into the workings in related fields, especially when these fields are so highly specialized that the average Tool Engineer has little or no opportunity to obtain more than a very superficial idea of how things are done.

After a satisfactory dinner at the Chevrolet Cafeteria, at which the Chapter was honored by the presence of Frank Curtis, National President of the A.S.T.E., a very fine color movie showing the operations in the Chevrolet Forge Plant was enjoyed. Following this an opportunity was given to inspect the operations "in the flesh," and a very interesting as well as instructive evening was the result.

Hats off to Ed. Kelly of the Chevrolet Forge Plant and the Chevrolet organization whose generosity, courtesy and thoughtfulness contributed so much to the enlargement of our experiences. And hats off to Clyde Mooney who made the visit possible.

By the way — Detroit is out front again in the membership drive, according to latest reports. Our nearest rival is trailing 490 points. Let's go!

Milwaukee

The Milwaukee Chapter of A.S.T.E. closed its season with a fine dinner and program on Friday evening, June 27, at the Astor Hotel. This was a rather gala event and was for members only. Dinner was served at 7 p.m., but just before entering the dining hall a barrel was tapped—and it wasn't nails. This amber fluid helped to put the boys in good humor for the events which followed.

One of the surprises of the evening was a talk on "My Impressions of America" by Count Askar Waldemar Cedarstrom of Copenhagen, Denmark, World Traveler, Author, Economist. Count Askar, after keeping the boys in suspense through the perfect dialect, and back of hornrimmed glasses, revealed his true character by speaking a very fluent English, and indicating that after all he was just an entertainer from Chicago.

Mr. Gene Fields, a very clever entertainer, acted as Master of Ceremonies

When You Specify
BARNES
HYDRAULICS

● You will be asked where and how you plan to use them. A bit unusual perhaps, but that's our way of doing business.

When you buy Barnes Hydraulics you buy more than just so much equipment. You buy an engineered application, designed and built for the job to be done. That's why manufacturers in such a wide range of industries bring their hydraulic problems to us for solution.

Here's another angle—users of Barnes Hydraulics over a period of many years under most severe operating conditions report maintenance costs at an absolute minimum—lowest by comparison. That means less down time, more production—A very vital factor to consider always and particularly during our National Defense Program.

For these and many other reasons it will pay you to specify

BARNES HYDRAULICS

Send us your inquiries with information about the job to be done. We'll be glad to submit a proposal or if you say so, we will have an engineer call.

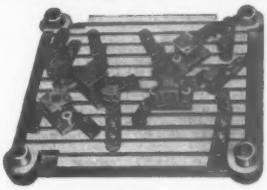
John S. Barnes Corporation

DETROIT SALES OFFICE
503 NEW CENTER BLDG.
TR-1-1706

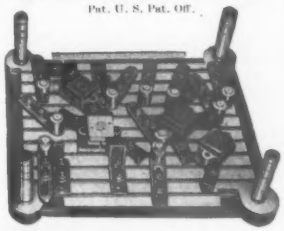
MAIN OFFICE
AND FACTORY
ROCKFORD, ILL.

WHISTLER
Adjustable Perforating Dies
CAN BE CHANGED AT WILL
WITHOUT ADDITIONAL DIE EXPENSE

OPERATES LIKE ANY SINGLE PURPOSE DIE



Pat. U. S. Pat. Off.



The Perfect "Set-up" for
PRECISION PERFORATING

Increase Production by saving days and weeks of single purpose die making. Whistler Adjustable Dies are ready to set up for *immediate production—absolutely accurate on short or long runs.*

Punches and Dies from stock —1/2" to 1 1/2". Larger sizes on order. Minimum perforating centers of 7/8". Self cleaning. In use by country's largest manufacturers.

FREE Handy catalog, illustrating and explaining Whistler Adjustable Perforating Dies and other Whistler dies, tools and special machinery, yours on request.

S. B. WHISTLER & SONS, INC.
736 MILITARY ROAD
BUFFALO NEW YORK

Visit Whistler, Booth G-50, National Metals Exposition, Philadelphia, October 20-24.

Is this AN ANSWER to your POLISHING *and* FINISHING PROBLEMS

Brightboy
WHEELS - DISCS - TABLETS - STICKS
for Polishing, Pre-Polishing, Finishing Metals

The *SOFT RUBBER* binder *CUSHIONS* the abrasive

LET US SEND YOU SAMPLES--MAKE YOUR OWN TESTS

IMMEDIATE DELIVERIES

Weldon Roberts Rubber Co., Newark, N. J., U. S. A.

Will Your Product Pass Final Inspection?

★ ★ ★ ★

Today as never before—

accuracy in 'tenths' means gage accuracy in Millionths!

★ ★ ★ ★

YOU MUST BE POSITIVE

and the sure way is with

Chrome Plated Gage Blocks

MADE BY

DEARBORN GAGE COMPANY
"Originators of Chromium Plated Gage Blocks"
22037 BEECH STREET DEARBORN, MICH.

for the floor show, and did a masterful job. Mr. Fields gave several impersonations of well-known radio characters, sang a few songs, and told some good stories. During the ceremonies he introduced Professor Slyter, Comedy Drunk Magician, who entertained the boys with some clever slight-of-hand performances.

Two exotic dancing girls accompanied by a pianist and an accordionist helped to round out the evening's fun.

Everyone went away feeling that the evening was well spent and that all had an enjoyable time. It was a fine way of ending up the year's activities.

Minneapolis-St. Paul

The membership of the Twin City Chapter of the American Society of Tool Engineers and Northwest industry were well represented last evening at the Society's first study club meeting called for the purpose of discussing and solving production and tooling problems. The meeting was held at Dunwoody and followed a 6:30 o'clock steak supper.

Glenn Roberts, President of the Northwest Automatic Products Corporation and Chapter Chairman, welcomed the members and guests, many of whom came with questions pertaining to the manufacture or processing of some Defense item. He outlined the purpose of the meeting and their plans to have one each week and other arrangements for making their expert advice available to any manufacturer desiring same.

Defense Contract Service, OPM, was represented by their Production Engineer, E. H. Pitney in the absence of H. C. Timberlake, District Manager, who is in Washington all this week with Roger Shepard, District Coordinator. Mr. Pitney covered briefly the niche in the Defense Program where his office fits, touched on the complex subject of Priorities, and gave those present a little advance information on some subcontracting possibilities. He gratefully acknowledged the patriotic motives back of the Society's generous, stringless offer to help and particularly how this practical assistance had already been of value to firms for whom his office had arranged contracts.

Tooling is the basis of all production, so by making available for consultation such expert committee chairmen as Glenn Roberts (Automatic Screw Machine), E. O. Wistrand (Punch Press), A. E. Hammerlund (General Machine) and Charles G. Adams (Moulded Products), Mr. Pitney stated that in his opinion the service the Society was offering would be taken advantage of to even a greater extent in subsequent study club meetings when industrialists learned just what they can get for the asking.

Present plans call for these study club meetings at frequent intervals as will be announced in the newspapers, but it was brought out if any tooling advice was needed urgently by a manufacturer, the proper committee would cooperate even to the extent of a special conference.

New York-New Jersey

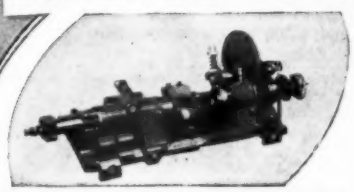
The memories of a wonderful day, a wonderful crowd and a list of many things that would exhaust the stock of adjectives of the best press agent in existence, will be with the 350 guests that attended the annual picnic of Chapter 14 of the A.S.T.E. of New York and New Jersey, for many moons to come.

Our Chairman, Charles Bazaz of the Wright Aeronautical Corporation "went to town" and turned in one of the finest jobs in the history of this body.

For those of his committee who helped to put on such a wonderful

OHIO UNITS Superfinisher
LICENSED BY CHRYSLER

Both These Machines Vital for Speeding Up Defense Programs

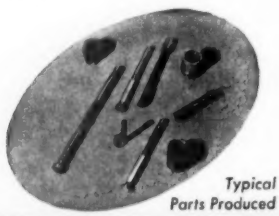


OHIO UNITS CAM GRINDER UNIT READY FOR MOUNTING ON GRINDER

CAMS . . . odd shaped parts . . . are produced on OHIO MULTIPLE CAM GRINDER UNITS. The Ohio Multiple Cam Grinder Units are compact . . . sturdily built and designed for mounting on practically ALL STANDARD CYLINDRICAL GRINDERS.

These cam grinders incorporate an exclusive principle of contour control, found in no other machines and provide advantages in production, duplication, and most important of all, accurate parts. They have been thoroughly proven as a valuable unit by years of satisfactory service with leading manufacturers in all types of industries. Constantly, new applications are being found where they save time and money and increase the accuracy of a product.

Write for our catalog which describes these machines thoroughly, and shows you why we can duplicate accurate parts to close limits.



Typical Parts Produced

SUPERFINISHING two diameters simultaneously

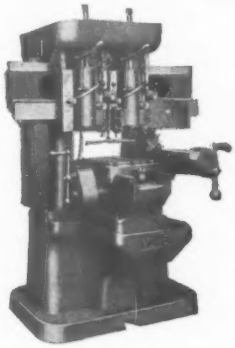
Here is a job that requires a fine finish at a high production rate. This piece has a SUPERFINISH surface approximately 25" long and 1½" in diameter and two surfaces approximately ½" wide and 4" in diameter. The SUPERFINISHING on all these surfaces is done simultaneously. Two SUPERFINISHING heads are used—the one at the left is stationary and the stones are oscillating while the work is being revolved on the two flanges. The other head is mounted on a separate table which automatically traverses in both directions on the bed covering the entire length of this bearing surface which is approximately 25" long. On this same machine many other parts can be SUPERFINISHED. A flat SUPERFINISHING attachment can be attached to this machine. We have mounted as many as ten SUPERFINISHING heads on a single machine, doing that many operations simultaneously.

The machine is of simple design with motor and pump for the lubricating and SUPERFINISHING liquids self-contained and incorporated in the design. If your work requires ultra smooth surfaces you should investigate modern SUPERFINISHING as obtained on the OHIO UNITS SUPERFINISHER.

Send samples for SUPERFINISHING or send us your blueprints for recommendations and ask for our latest bulletins on SUPERFINISHING.

OHIO UNITS MANUFACTURERS • DAYTON, OHIO, U. S. A.

MOREY VERTICAL— No. 12M High Speed PROFILER MILLER



Production of interchangeable parts requiring milling of any contour or outline can be materially speeded up by this Profiling and Milling Machine.

Ask for Circular No. 680-A

MOREY
MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

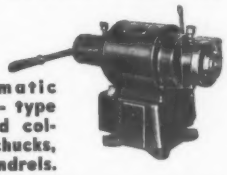
SCHAUER Speed Lathes

For speedier, more economical finishing of small metal and plastic parts...

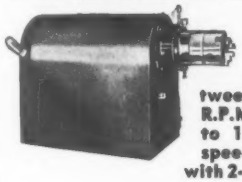
Finishing • Polishing
Lapping • Burring

• IDEAL SPEED LATHE

Equipped with single or 2-speed motor; exclusive, automatic brake; spring - type hand - operated collet, or step chucks, expanded mandrels.



• VARIABLE SPEED LATHE



with infinite selection of spindle speeds, between 65 and 5,000 R.P.M. (ratio of 6 to 1 with single speed and 13 to 1 with 2-speed motor.)

• We design special lathes to meet individual production requirements.

WRITE FOR BULLETIN No. 400

SCHAUER MACHINE CO.
2066-68 Reading Rd., Cincinnati, O.

RUTHMAN GUSHER COOLANT PUMPS

COMPACT!

The built-in conduit box simplifies wiring... and, the compact design makes installation in small space easy. Other famous Gusher features,— sturdy vertical shaft on ball - bearings, double suction intake giving balanced impeller. Speeds jobs, increases profit.

There's a Gusher model to fit your needs.

Model P-3

P-3 is available in external right or left discharge models, flange - mounted and immersed models.

Pat. and Pats. Pending.

THE RUTHMAN MACHINERY CO.
1815 READING ROAD, CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

FOR MODERN METAL CUTTING TOOLS *Specify* **NATIONAL**

NATIONAL TWIST DRILL & TOOL CO., Detroit, U.S.A.

TWIST DRILLS • REAMERS • HOBS • MILLING CUTTERS • COUNTERBORES • SPECIAL TOOLS

Tap and Die Division WINTER BROTHERS CO., Wrentham, Mass.

Factory Branches • San Francisco • New York • Chicago
Philadelphia • Cleveland • Distributors in Principal Cities

EVANS HIGH SPEED STEEL REAMERS

WILL SHIP ON 30 DAYS' TRIAL

WRITE FOR CIRCULAR

LOOK AT THESE FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

EVANS FLEXIBLE REAMER CORPORATION
4539 Ravenswood Ave., Chicago, Ill.

IN DETROIT THE TRAVELER'S 1ST CHOICE

Seasoned travelers, when they visit Detroit, most always stop at the hotel that's "Aglow with Friendliness." They appreciate the extra value they get for every dollar they spend.

900 rooms with bath, circulating ice water and Servidor from **$2.50.**

HOTEL FORT SHELBY
"Aglow with Friendliness"
J. E. FRAWLEY, General Manager

demonstration of sportsmanship and cooperation we have also the highest praise.

Special mention should go to Remo Rege, also of Wright Aeronautical who not only made himself extremely hoarse with the constant use of the microphone, but who also did a particularly outstanding job as chairman of the prize committee.

Saturday morning dawned clear and hot. They arrived at the grove, after parking their cars in a field covered with some freshly cut hay. The first thing they saw was a crowd around a series of tables. All joined in. Man, Oh, Man. what a collection of prizes. Without any exaggeration whatever, those tables were covered with prizes to the tune of about 250 items. Everything from fountain pen and pencil sets, to exceptionally good wrist watches, clocks, barometers, radios, drill presses, tools, trick screw drivers, golf bags, golf clubs, hats, and a list too long to mention. As each of the members or guests would arrive, one glance at that series of prizes aroused every ounce of sporting blood a man could have, for those prizes were worth going after. And the good natured crowd did really put on a show.

There were three soft ball games. And every man on each of the six teams really did his level best to play ball. In each case, every member of the winning team received an order for a hat.

Some of those who went in for lesser exercise joined the horseshoe pitching contest, and there was keen rivalry as each team would approach the finals.

Practically everybody took a hand at the game of dart throwing, but few came even close to hitting the board, much less getting a real score. And again the prize committee came thru with some excellent gifts for the winners.

Then there was the shot put and as your reporter remembers it. one of the men actually heaved that shot something like 46 feet. That's not bad throwing. Again prizes.

Golf pitching contest, sack race, 50 yard dash, tug of war, nail driving contest and in each case, prizes for the best man in the field.

They started in about one o'clock in the afternoon and all day long, in between games and in between good natured kidding, there were copious quantities of clams on the half shell, clam broth, clam chowder, hot sausages, hot frankfurters, roast beef, hamburgers, coffee, tea, and of course great quantities of the amber fluid—beer to you—which helped nobly to withstand the heat of the day. Several groups went in for pinochle, poker, etc. but most of the crowd was on the move all day, eating and joining in the many games. Several times the barber shop groups tried to sound off, but they were lost in the other activities. Then about six o'clock, after giving out prizes most of the day, Remo Rege, stood nobly by the mike to call out the winners of the many door prizes (no wonder he lost his voice).

Some of the funny sights that will be remembered: Chairman, Frank Oliver, did a noble job with a team mate in the sack race. Remo Rege and his John Law cap and badge. Charles Bazaz and his flying shirt tails. Wally Gray lugging home the drill press.

While they had many good men and true in the party, they could not overlook one or two distinguished guests. Mr. Ray H. Morris, their Second Vice President of the "National Body" and another visiting fireman, Tom Orchard, Chairman of the Greater New York Chapter, No. 34. The food has long since been digested, the prizes long since beer added to the family album,

7 IMPORTANT FEATURES

HD 13
DRILLER

Seven important features make this Moline straight line driller the best machine for faster and easier drilling of PLATES—STRIPS—CHANNELS—ANGLES—TUBES—CASTINGS.

1. Approximate capacity—Twelve ¾" or Sixteen ½" drills in steel.
2. Furnished in 6, 8, and 10-ft. length.
3. Spindles can be added or removed or spacing changed in a few minutes' time.
4. Special out-of-line spindle heads can be furnished.
5. R.P.M. of spindles can be varied to suit requirements.
6. Equalized, hydraulic, table feed.
7. Automatic, electrically controlled feed cycle.

BORING — HONING — DRILLING — SPECIAL MACHINERY

MOLINE TOOL COMPANY

MOLINE, ILLINOIS **ESTABLISHED 1901**

BALDOR
BALL BEARING GRINDERS
for accurately sharpening
CARBIDE TOOLS
1-YEAR GUARANTEE

BALDOR CARBIDE TOOL GRINDER is precision-built for accurately and quickly sharpening Carbide Tools. Sturdy ½ H.P. heavy duty, ball-bearing, reversible Motor. Large adjustable tool-rest tables. Satisfaction guaranteed.
NEW LOW PRICE $84.00
WRITE FOR BULLETIN 208
BALDOR ELECTRIC COMPANY
4355 Duncan Ave. St. Louis, Mo.
BUILT BY MOTOR SPECIALISTS

A LaSalle Design
Tool Designing
Machine Designing
Aircraft Tool Designing
Product Designing
Engineering Service
LA SALLE DESIGNING CO.
628 W. LAKE ST.
CHICAGO, ILLINOIS
Monroe 2345

the songs have long since died down, but the memory lingers on.

Rochester

Clouds, sun, a few drops of rain, and then more sun, but Saturday, June 14, as a whole was a perfect day for Rochester's 4th Annual Picnic. About 320 members and friends gathered at Point Pleasant to a steak dinner with all the trimmings.

The water of Irondequoit Bay was smooth and clear and characterized the fine operation of the picnic itself. Charlie Seely of I.B.M. as Picnic Chairman with his able outside man, Jake Phillippsen, the big tool and die man, assisted by hard-working committee did a bang-up job. Sports, refreshments and prizes all were of the highest quality. Even Tony Froman won his usual prize. Clarence Buss of Bausch & Lomb and other B&L men had their names called, but probably were fishing off the dock as they did not collect prizes they were entitled to, the same being collected by the next numbers called.

Gerry Sick of Camera Works did a real job in selling tickets. Top honors in the field go to Gerry. The prize contributors did a good job also as 35 were graciously contributed by members and friends of the Society. When Fred Vondeven of Hawk-Eye sports his Stetson hat, it is proof that he like 320 others enjoyed the 4th Annual Picnic of the Tool Engineers at Rochester.

Seattle

The Seattle Chapter of the A.S.T.E. at a meeting on June 10 had the opportunity of hearing a most interesting speech by Mr. A. T. Lundgren, Chief production engineer of Vega Aircraft. A well known character in aviation manufacturing circles, Mr. Lundgren's talk was based upon his experiences in European aircraft industries which he has had unusual opportunities to inspect. His comparisons between our production methods and production methods of German aircraft industry are very enlightening and very interesting from the standpoint of Tool Engineers.

St. Louis

Once again to the foothills of the Ozarks, three hundred members of the St. Louis Chapter 17 wended their way on July 12th for their annual picnic. The pilgrimage into the country started early in the morning, and continued until late in the afternoon. The members were well rewarded for the trip, because the committee had arranged for plenty of solid and liquid nourishment, games, attendance prizes, swimming, races, etc., etc. Among the visi-

SHELDON Back Geared Screw Cutting PRECISION LATHES
For production:
Lever Operated Double Tool Posts
Lever Operated Collet Attachment
Lever Operated Tailstock
For any production jobs (often on second operation work) these moderate priced lathes will surpass in output much more expensive machine tools. Costing less than $750. (with motor included) the 10" Sheldon Manufacturing Lathe (illustrated) comes with Hand Lever Collet attachment (Collet capacity ¾"), Lever operated Double Tool Slide, Hand Lever Tailstock, Semi-Quick Change Gear Box. With 4-speed underneath motor drive enclosed in pedestal leg. It's a complete operating unit that can be set up anywhere.

Write for Catalog of 10", 11" and 12" Sheldon Precision Lathes.
SHELDON MACHINE CO., INC.
4252 No. Knox Street
Chicago, Illinois, U.S.A.

TO INSTRUCT NEW MEN in the handling of DIAMOND TOOLS
we will send you a valuable booklet. No charge, no obligation.
KOEBEL DIAMOND TOOL CO.
9348 Grinnell Ave., Detroit
KAEBELITE
DIAMOND TOOLS
Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for all Industrial Purposes.

tors in attendance was Ed. Dickett of Rockford, Chairman of the National Membership Committee. Movie operators were busy making records of all incidents that will prove of interest when screened later in the season. Ed Doogan, and his committee are indeed entitled to the thanks of all members of the Chapter for the effort they put forth to make the picnic a huge success.

Toledo

The Toledo Chapter held a social meeting on June 9. It was their annual ladies' night affair.

An excellent dinner was served and after dinner the tables were rearranged, and an enjoyable evening was spent dancing and seeing an exceptionally interesting floor show. The master of ceremonies presented an engineering problem to the Tool Engineers present who semed unable to offer a satisfactory solution. The ladies, however, were invited to present their opinions and did as well as their engineer husbands, showing that the education of the ladies in the home is an important part of the Tool Engineer's business.

The Committee received many compliments on the results of this party.

Dayton

The July meeting of the Dayton Chapter was held at the Inland Gun Club where Jack Blair and his cohorts put on a real stag party. Over one hundred members were present and enjoyed the fish fry, beer, baseball game, and motion pictures.

Production Notes

Extensive alterations and renovation of the former River Plant of the Westinghouse Company in Chicopee Falls, which was taken over by the J. Stevens Arms division of the Savage Arms Corp. are practically complete. The new plant will be in operation on a large order for the United States Army by August 1. Upwards of 2,000 persons will be employed, and double that number may eventually be employed in an expanded program.

The government extended its control over copper supplies July 10 to include copper-base alloys and fabricated products such as brass and bronze. E. R. Stettinius, Jr., defense director of priorities, said at Washington that the original copper order required that refiners, after setting aside a quantity for an emergency pool, were to distribute their remaining copper so that each customer would receive an equal percentage of his orders. "Because of the shortage in copper," Stettinius said, "the amendment removes this provision and stipulates that, after copper has been set aside for the pool, defense orders must be given preference over non-defense orders."

Undersecretary Robert P. Patterson reported July 12 that the War Department broke all records for American military expenditures in June by obligating a total of $4,986,300,310 of national defense funds. Patterson termed the outlay "eloquent proof of the War Department's determination to expedite the letting of contracts to the limit." Contracts were let at the average rate of $199,452,012 for every business day. Of the total, $2,297,476,278 represented air corps orders, and $1,500,231,225 contracts for ordnance. By contrast, Patterson noted that the army in 1924 received appropriations of only $251,250,231 for the entire year.

William S. Knudsen, co-chief of the Office of Production Management, urged 16,000 Consolidated Aircraft employes at San Diego, Cal., July 17 to "cut two pieces of metal where you have one before." The added effort, he said, would aid in this nation's determination to preserve the American system of equal opportunity for all.

MIDWEST
TAPER AND PIN
DRIVES
• ABSOLUTE RIGIDITY AND PERFECT ALIGNMENT BETWEEN TOOL AND HOLDER
• EFFECTIVENESS UNIMPAIRED THROUGH LONG USE
• SIMPLE AND APPLICABLE TO A WIDE VARIETY OF TOOLS
MIDWEST HOLDER
(Tool removed)
The Midwest Drive holders have a stub taper socket with a round pin partly imbedded in the wall; Midwest cutting tools have a corresponding stub taper shank with a groove to fit the pin in the holder. No keys, screws, bolts, or springs are employed—no loose parts easily dislocated or lost.
The Midwest Drive is simple—applicable to a wide variety of tools. Its rigidity and effectiveness are still intact even after long and continuous use. The holder is designed so tools can be interchanged rapidly.
Illustration above shows Midwest countersink, counterbore, end mill and core drill. The Midwest drive can be applied to these and many other types of tools.
Ask for Catalog 17

MIDWEST TOOL & MFG. CO.
WEST JEFFERSON & 15TH ST. • DETROIT, MICH.

MIDWEST Precision METAL CUTTING TOOLS
END MILLS • SLEEVES • COUNTERBORES • DRILLS • SPECIAL TOOLS
REAMERS • MILLING CUTTERS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

MODERN COLLET PARTS

Supplied For ALL OF THESE MACHINES

Modern Collet's parts service is "all-inclusive". When any part requires replacement, regardless of the type of screw machine on which it is used, you can be sure that it can be supplied by this company. You enjoy the benefits of one convenient source of supply . . . you get parts which, in every case, always equal or excel the parts they replace. Get in touch with your Modern Collet representative or write directly to the factory.

Shown above are machines in the plant of the Federal Screw Works, Detroit who are customers for Modern Collet parts and tools as well as rebuilding service.

MODERN COLLET and MACHINE CO.
407 Salliotte St. • Ecorse, Michigan

T. H. L. FRONT LEVER BENCH PUNCH

PRICE WITH ONE PUNCH AND ONE DIE—

$50.00

Immediate Shipment

Built for hard tough work — die cannot lose alignment with punch — all parts interchangeable.

Capacity ½" holes through ⅛" steel; 5/32" through ¼" steel. Can also be made for holes up to ⅞" in thinner metal. Stock punches and dies available from ⅛" to ½" by 64ths.

Weight, 70 lbs.

T. H. LEWTHWAITE MACHINE CO.
(Est. 1890)
307 E. 47 St. NEW YORK

FlexoiD Industrial Couplings

with Thermoid Hardy discs

—•—

FlexoiD Tool Holders

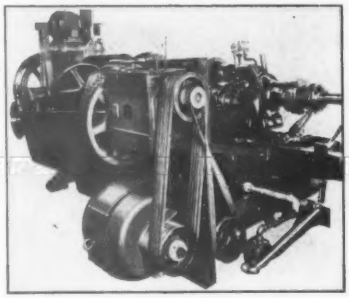
with Universal Head

"It's all in the Tool"

—•—

FlexoiD Speed Control

Converts old machine tools into modern individual drives



FlexoiD Unit applied to Cleveland Automatic

Write concerning nearest distributor

The Smith Power Transmission Co.
1545 E. 23rd St., Cleveland, Ohio

IMMEDIATE DELIVERY

AUTOMATICS

No. 00 & 19 Brown & Sharpe
1¼" Gridley 4-spindle Model F., SPD.
2¼ & 3¼" Gridley single spindle
No. 22 New Britain

DRILLS

No. 1A Edlund H.S.B.B., 4 Spdl., Power Feed, M.D.
Assorted High Speed & Sliding Head
3½' Fosdick Radial, SPD.

GRINDERS

6" x 32"; 10 x 18 & 24, Norton Plain
6" x 20" Fitchburg, Plain
10" x 24" Landis, Self Contained
16" x 66" Landis Plain

LATHES

Hendey Yoke Head, 12 x 5, 14 x 5 and 18 x 10'
24" x 10' Schumacher-Boye, Quick Change, C/S

MILLING MACHINES

No. 3 & C.S. Becker Vertical
No. 12 Brown & Sharpe Mfg.

PLANERS & SHAPERS

44" x 44" x 18' Niles Tool Works, 4 Heads
30" x 30" x 18' Gray, 2 Heads
24" Queen City Heavy Duty Shaper; Motor Drive

PRESSES

No. 74 & 75 Toledo Open Back
No. 2, 3, 4 & 5 PG Farracute Solid Back
No. 1 to 7A Niagara, O.B.I.

MACHINE TOOLS POWER PRESSES

OTT MACHINERY SALES INC.

546 Second Ave. Detroit, Mich.

HELP
For Your HOLE Difficulties

Call your nearest Specialist

F. L. Peabody—103 Bigelow St., Quincy, Mass.
C. D. Proctor Co.—30 Church St., New York, N. Y.
P. A. Patterson Co.—2039 N. Broad St., Philadelphia, Pa.
H. M. Rogers—1126 Glencove Road N., Syracuse, N. Y.
H. E. Galvin—1501½ N. Main St., Buffalo, N. Y.
T. J. Fraser Sales Co.—14472 Euclid Ave., Cleveland, Ohio
C. A. Wales—27 N. Jefferson St., Chicago, Illinois
R. T. Monahan—474 Paul Brown Bldg., St. Louis, Mo.
E. Willard Pennington—2629 Pleasant St., Minneapolis, Minn.
Jack Brewer—2060 Santa Fe Avenue, Los Angeles, Cal.
Chas. F. Staples—1366 Yosemite, Birmingham, Mich.
F. F. Barber Machinery Co., Ltd., Toronto, Montreal & Walkerville, Ontario, Canada

Cogsdill Bearing-izers
Govro-Nelson Drill Units
Multi-Unit Drilling Machines
Special Equipment for Holes

Send Drawings for Recommendations
No Obligation

"HOLE"
ENGINEERING SERVICE
5901 FOURTH AVE. DETROIT, MICHIGAN

"It might well be that many defense items can remain in production because of your ability to provide tools from existing material during these times when new material is seriously delayed or unobtainable." (From a letter to us by the Secretary of a prominent Engineers' Society.)

NATIONAL TOOL SALVAGE CO.
3816 Beaubien St.
Detroit, Mich.

The Passing Parade

Mr. James R. Weaver, past national president of A.S.T.E., has taken over his new duties as manager of Louisville Ordnance Division, Westinghouse Electric and Manufacturing Company, at Louisville, Kentucky. Mr. Weaver, formerly director of inspection, tests and equipment at Westinghouse, Pittsburgh, is admirably well equipped to direct the important work that has been assigned to him.

Sherman Barnes, in charge of the Western New York territory of Ampco Metal, Inc., Milwaukee, Wisconsin, has established new headquarters at 699 Potomac Avenue, Buffalo, N. Y. Mr Barnes is familiar with the many diverse applications of Ampco Metal, an alloy of the aluminum bronze class, and his experience will be of benefit to manufacturers seeking alloys which are highly resistant to wear, fatigue, and corrosion.

Frederick C. Gladeck, a consulting engineer with long experience in ordnance work will be associated with Joseph S. Pecker and Harry A. Simpson in their work as professional mechanical engineers and owners of Machine and Tool Designing Company, Phila.

Mr. W. A. Barr, President and General Manager of Foote Bros. Gear & Machine Corporation, announces the appointment of Mr. Russell G. Davis as Manager of the Commercial Gear Plant at 5301 South Western Blvd., Chicago, Ill. He enters the Foote Bros. organization with a background of twenty years service with the Chain Belt Co., of Milwaukee, where he progressed through the positions of student apprentice, general foreman Chain Division, District Manager of the Southwestern Division with offices at Houston, Tex; District Manager of Chicago Territory and Assistant to the Sales Manager of the Chain Division.

Commercial Gear's Davis
Twenty years past apprentice.

Norton Company, Worcester, Massachusetts, manufacturers of grinding machines, grinding wheels and other abrasive products, has announced the appointment of Paul Fielden director of purchases. Mr. Fielden has been connected with the company 21 years as assistant credit manager and credit manager. He has been prominent in local and national credit men's associations and in 1937-1938 was president of the National Association of Credit Men.

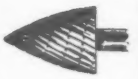
John Miller, for a number of years assistant credit manager of Norton Company, succeeds Mr. Fielden as credit manager.

Marcus W. White retains the position of purchasing agent, which he has held with the company for many years.

Mr. J. A. Siegel, Detroit, past national president of A.S.T.E. and prominent in machinery circles is now associated with A. C. Haberkorn Machinery Company. Mr. Siegel was for many years, chief tool designer with Packard Motor Company and was more recently con-

SAVING SHARPENING TIME
SAVES PRODUCTION TIME
PROGRESSIVE SHOPS USE
LOVEJOY MILLING CUTTERS
AS STANDARD EQUIPMENT
Good milling cutters will remove the maximum amount of metal before resharpening is necessary, but that is not enough! Lovejoy mills are designed to give maximum service between grinds—*and minimum down time during grinds.* This is made possible through the exclusive Lovejoy Positive Locking Device used for holding the blades. This device allows the grinder operator to remove and reset the *interchangeable* Lovejoy blades quickly, easily and accurately. It also allows the removal of only enough stock for resharpening, thus greatly increasing the life of every blade. For utmost economy and production specify Lovejoy Milling Cutters.
Ask for Catalog No. 26 for complete details on the modern LOVEJOY line of milling cutters.
LOVEJOY
MILLING CUTTERS
LOVEJOY TOOL CO., Inc.
Springfield, Vermont

REGRIND TO LOWER COSTS EVERANC



ROTARY POWER CUTTERS
"Ground from the Solid after Hardening"

DESIGNED AND SERVICED BY
SEVERANCE TOOL COMPANY
1522 East Genesee Avenue SAGINAW, MICHIGAN

MEMBER REGRIND TO SAVE TIME

U S HEADS
STANDARD SINCE 1915

30 DIFFERENT STANDARD SIZE ADJUSTABLE DRILL HEADS, CAPACITIES UP TO 1½" DRILLS

SEND US YOUR B/PS

All Types of Fixed Center Heads

UNITED STATES DRILL HEAD CO.
Cincinnati, Ohio

HI-POWER GRINDER
SPEEDS AMERICA'S PRODUCTION

For hundreds of difficult grinding jobs, nothing compares with the HI-POWER—a constant service tool that gives smooth, precision performance. Has ample power to drive a 2½" diam. wheel. 17,000 r.p.m. Wt. 3 lbs. In wood case, with accessories, $35.00.

CHICAGO MOUNTED WHEELS **FIRST and FINEST**

Actually cut grinding costs ⅓ to ½. Made of V/T Super Bond, the toughest bond made—will stand up under the most exacting conditions. Hold their shape and grind more pieces per wheel faster and without sacrifice to cutting action.

TEST WHEEL—Try one free. Tell us kind of job, grinder you use and size wheel preferred.

HANDEE TOOL OF 1001 USES

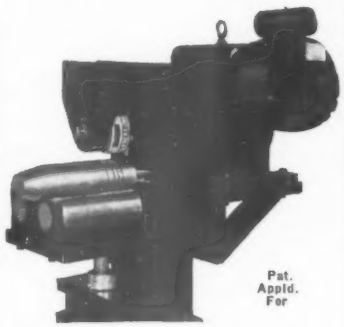
The little Caesar of grinders. Also drills, polishes, cuts, routs, carves, sands, saws, sharpens, engraves, etc. DeLuxe model 12 oz. 25,000 r.p.m. With 7 Accessories, $18.50.

IMMEDIATE SHIPMENT Send for the Hi-POWER or the HANDEE on 10 Days Trial.

Catalog of Complete Line on Request

CHICAGO WHEEL & MFG. CO.
1101 W. Monroe St., Dept. TE. Chicago, Ill.

SHELL MARKING MACHINE No. 1
FOR ROUGH FORGED OR FINISHED SHELLS



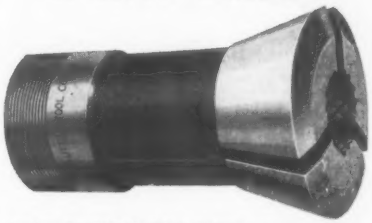
Pat. Appld. For

- For stamping around circumference of rough forged or finished shells.
- Motor driven.
- Made for any size shell.
- Can be geared to suit the speed of any production line.

Write for "Shell Marking" circular.

M. E. CUNNINGHAM CO.
169 E. Carson St. Pittsburgh, Pa.

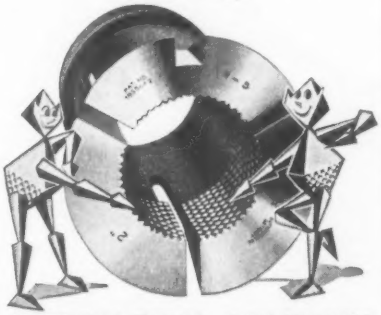
For each make and size of Screw Machine



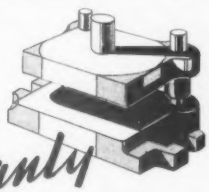
Sutton DIAMOND-GRIP Collets are expertly designed and accurately machined to suit the specifications of each make and size of screw machine. They all have Sutton diamond serrations that grip tighter under less tension. Only Sutton Collets are diamond-serrated.

● Complete Sutton Catalog lists all styles of DIAMOND-GRIP Collets and Feeders for all standard screw machines; also lathe and milling machine collets.

Ask for a copy



SUTTON TOOL COMPANY
2895 W. GRAND BLVD. DETROIT, MICH.
Accessories for Screw Machines



Danly

PRECISION
die sets

Danly Commercial Sets
Danly Special Sets
Danly Die Makers' Supplies

DANLY SERVICE
9 Danly Branch Stocks Provide 24-Hour Service for 95% of All Metal Fabricating Plants

Danly Machine Specialties, Inc.

2122 South 52nd Avenue, Chicago, Ill.; Milwaukee, Wis., 513 East Buffalo Street; Long Island City, N.Y., 36-12 34th Street; Dayton, Ohio, 990 E. Monument Avenue; Detroit, Michigan, 1549 Temple Avenue; Rochester, N.Y., 16 Commercial Street; Cleveland, Ohio, 1745 Rockwell Avenue; Philadelphia, Pa., 3913 North Broad Street. Ducommun Metals & Supply Co., Los Angeles, Calif., San Francisco, Calif.

DANLY
DIE MAKERS' SUPPLIES

nected with the Leland-Gifford Company. Mr. Siegel brings to his new position a splendid background of practical experience.

Arnold Thompson, of Toronto Chapter, Consulting Tool Engineer for Defense Production, has set up an office operating under the name of "Tool Engineering Service (Toronto)" at 58 Richmond Street East, and has an assignment to tool up for Field and Naval guns.

The appointment of Mr. W. A. Fletcher as District Sales Manager for the Western Division of E. F. Houghton & Co., manufacturers of oils, leathers and metal working products, Philadelphia, is announced.

Mr. Fletcher will maintain his headquarters at 835 Harrison Street, San Francisco and will be in charge of sales in California, Oregon and Washington. He has had a long record with this Company, having formerly been District Sales Manager in Cleveland and more recently head of their Government Products Division.

Philip N. Cooke, sales manager of Norton Company of Canada, Limited, Hamilton, Ontario, has been appointed resident manager succeeding Robert C. Douglas who died May 29.

Mr. Cooke has been with the Canadian plant from its beginning, having left Worcester in June, 1920, as one of the original Canadian-Norton organization. For the first few years he held the title of sales engineer but for more than 15 years his position has been that of sales manager. Previous to the Canadian assignment he was in the sales engineering department at Worcester for four years.

D. M. Chisholm of the Canadian sales organization succeeds Mr. Cooke as sales manager.

Edwin Fisher, associated for the past thirteen years with the Cadillac Motor Car Company, and for the past four

Progressive Welder's Fisher
After thirteen years . . .

years Manager of Cadillac Jefferson Ave. Branch in the Detroit Area, has resigned from G. M. to join Progressive Welder Company in an executive sales capacity.

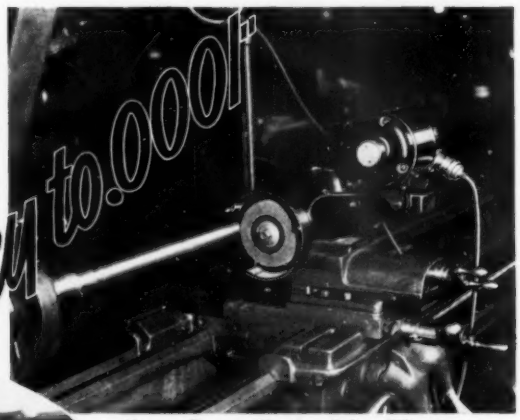
In his new connection, Mr. Fisher will assist in the development of sales of Progressive Welder's resistance welding equipment in the middle Western area.

Died

Alfred E. Murdock, who has been a member of the Hartford Chapter of A.S.T.E. almost since its organization, passed away on July 7th.

At the time of his death, Mr. Murdock was employed as Technical Advisor to the Purchasing Department of the Pratt & Whitney Aircraft of the United Aircraft Corporation, East Hartford, Conn. His earlier experience included several years as Works Manager of Plant C of the New Departure Mfg. Company, located at Elmwood, Conn. Several years with the Pratt & Whitney Division of Niles-Bement-Pond Company on testing and tool development work. He served his time in the ma-

Dumore grinders are used by watchmakers to get greater accuracy in tools and dies.



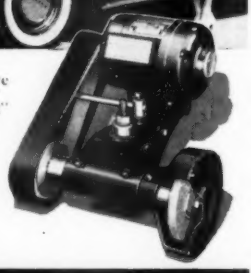
Above: Dumore No. 7 putting a mirror-like finish on a tool steel shaft.

Below: Wherever automobiles are built you'll find Dumore Tools.

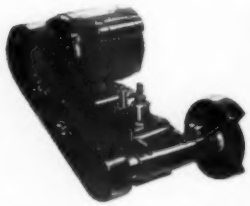
Refinishing rubber printing rolls with a Dumore grinder.

Where precision of fit or finish is essential . . . and cost is a consideration . . . do as others are doing . . . put Dumore Grinders to work. They make savings up to 30% as compared to alternative methods and equipment costs. Ask your Dumore Distributor for full facts and a demonstration in your shop or write for catalog.

THE DUMORE COMPANY
Dept. 221-H RACINE, WISCONSIN



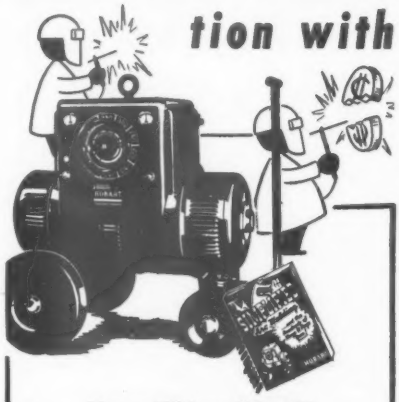
Dumore No. 7 Giant" ¾ H.P.



Dumore No. 77 "Mogul" ⅛ H.P. (With Induction Motor)

Dumore PRECISION Grinders

SPEED UP Production with



New "Simplified" ARC WELDING

● Delays were never more costly than they are today! Greater production speeds have become imperative! Put Hobart Arc Welders on your important job . . . they are noted for their speed factor. On continuous work without let-up, they will deliver the same high quality welds day after day. Ease of operation plus lowered current costs make Hobart your best arc welder buy! Write for complete details.

FREE!

Get this valuable book . . . it tells you how to apply arc welding to hundreds of new jobs.

HOBART BROTHERS
Box TE-81 TROY, OHIO

GARRISON GEAR CHUCKS

are used on—

- GEAR SHAPERS
- DRILL PRESSES
- ENGINE LATHES
- TURRET LATHES
- INTERNAL GRINDERS
- EXTERNAL GRINDERS
- OSCILLATING GRINDERS
- DIAMOND BORING MACHINES
- HORIZONTAL BORING MILLS

and are used for—

Grinding . . . Precision Boring . . . Machining and other operations on Spur . . . Internal . . . Bevel . . . Cluster . . . Helical and Herringbone Gears.

GARRISON
MACHINE WORKS, INC.
DAYTON OHIO

—PASSING PARADE—

chine shop of the Plimpton Division of United States Envelope Company in Hartford.

Mr. Murdock's loss will be keenly felt by his many friends.

On Thursday, June 6, Mr. Warren Gilman Jones, President of the W. A. Jones Foundry & Machine Company, Chicago, succumbed to a heart attack and passed away at his home in River Forest, Ill. Warren G. Jones was very well known in industrial and engineering circles. He was born in Chicago in 1890 and entered his father's firm in 1910. Since 1925 he had been President. He was also Vice-President of the Sackett Screen & Chute Company of Chicago. Mr. Jones is survived by his widow, Gertrude, three children—Mrs. Marion Beales, Warren G., Jr., and Thomas A. Jones—and three grandchildren. His sons are connected with W. A. Jones Foundry & Machine Company.

Andrew J. Cook, owner of the Fisher Machine and Tool Company, Buffalo. N. Y., for the past 10 years, died June 10.

INDUSTRIAL RELATIONS COMMITTEE
A. S. T. E.
2567 W. Grand Blvd., Detroit, Michigan
PERSONAL SERVICE FOR MEMBERS

SITUATIONS AVAILABLE

EXPERENCED MAN WANTED TO WORK AS SUPERINTENDENT OF HEAT TREAT DEPARTMENT with Company in Detroit, Michigan. Must have had experience in the Heat Treating of Airplane Engine Parts.

TOP FLIGHT MECHANICAL DESIGNER with a record of accomplishment to work in Research Division of a Gear and Machine Corporation. This work requires an experienced man who can accept and delegate responsibilities. Compensation will be in line with the responsibilities. Location: Chicago, Ill. This is not defense work.

EXPERIENCED MAN NEEDED TO HEAD UP EXPERIMENTAL WORK in a new experimental laboratory of a Gear and Machine Corporation. Besides customary testing for fatigue and endurance, there will be opportunity to contribute in the development of new products, opportunity to make competitive product analysis and the like. This work requires an experienced man who can accept and delegate responsibilities. Compensation will be in line with the responsibilities. Location: Chicago, Illinois. This is not defense work.

SITUATIONS WANTED

SERVICES AVAILABLE OF A FIRST-CLASS, ALL-AROUND PRACTICAL FACTORY SUPERVISOR, thoroughly experienced in mechanical, production, inspection, developing, processing, investigating, instructing, etc., in railroads, oil tool, tool, automotive and aircraft industries. This man not only can tell the other fellow, but if necessary, can operate the equipment. Applicant is able to work in any section of the country.

MECHANICAL ENGINEER, OPERATING AS MANUFACTURERS' AGENT WITH LINES OF MACHINE TOOL SPECIALTIES, and doing business with metal products manufacturers, tool, die, and machine shops throughout Wisconsin and Northern Illinois, desires affiliation with additional manufacturer of fast moving products of merit on exclusive basis. Will favor related lines, or products that will be absorbed by local products in the process of manufacture.

CLASSIFIED ADVERTISING
THE TOOL ENGINEER
2842 W. Grand Blvd. Detroit, Mich.

SITUATIONS AVAILABLE

SPECIAL MACHINE AND FIXTURE DESIGNER with shop experience, by a growing concern specializing in drilling and boring equipment. Box 718, The Tool Engineer.

EVEREDE BORING BAR HOLDERS

The Everede Boring Bar Holders are adjustable to fit various size lathes. (Bushings are furnished with each boring bar for use in the Holders.) Everede Holders keep the boring bar in a horizontal position, regardless of any change in the size of the lathe, within limits.

The No. 1 Boring Bar Holder is used on precision bench lathes from 7" swing to and including 9".

The No. 2 Holder is used on engine lathes from 8" swing to and including 12", and the No. 3 Holder on engine lathes from 12" swing to and including 24".

The Holders are made of case-hardened alloy steel. A tool post block is attached to the engine lathe Holders by a chain as shown.

Send for descriptive folder.

EVEREDE TOOL CO.
Willis Stutson
184 N. WACKER DRIVE, CHICAGO
Representatives in principal cities

LESS OPERATIONS AND FAR BETTER WORK WITH A GATCO

ROTARY PILOT BUSHING

Pilot and bushing fits with a PUSH fit, therefore a perfect bore

ROUND-CHATTERLESS-SMOOTH

DUST-PROOF

AS A WATCH

GATCO Rotary jig and pilot bushing is built for core drilling, diamond boring, turret tool piloting, piloting hollow mills, line reaming, carbide boring, spot facing, etc.

Write for full information and prices

GIERN & ANHOLTT TOOL COMPANY
1312 Mt. Elliott Avenue, Detroit, Michigan

ADVERTISERS APPEARING IN THIS ISSUE

The Tool Engineer

Advertising Offices: New York, Chicago, Providence, Detroit, San Francisco, Los Angeles
(see page 3 for addresses)

Acme Industrial Co. ... 83
Ajax Steel & Forge Co. ... 87
Allegheny Ludlum Steel Corp. ... 80
American Broach & Machine Co. ... 111
American Chain & Cable Co., Inc. ... 101
Ames Co., B. C. ... 75
Ampco Metal, Inc. ... 102
Apex Machine & Tool Co., The ... 89
Armstrong-Blum Mfg. Co. ... 76
Armstrong Bros. Tool Co. ... 103
Atlas Press Company ... 110

Baker Brothers, Inc. ... 59
Baldor Electric Co. ... 119
Barber-Colman Co. ... 13
Barnes Co., W. F. & John ... 31
Barnes Corp., John S. ... 115
Blanchard Machine Co. ... 97
Boice-Crane Co. ... 108
Boyar-Schultz Corp. ... 100
Bradford Machine Tool Co. ... 88
Brady-Penrod, Inc. ... 105
Brewster-Squires Co. ... 103
Brown & Sharpe Mfg. Co. ... 3rd Cover
Bryant Machinery & Engineering Co. ... 114
Burgess Battery Company ... 73

Campbell Division, Andrew C., American Chain & Cable Co., Inc. ... 101
Carboloy Co., Inc. ... 10
Carpenter Steel Co., The ... 12
Cerro de Pasco Copper Corp. ... 85
Chicago Rawhide Mfg. Co. ... 93
Chicago Wheel & Mfg. Co. ... 123
Cincinnati Milling Machines & Cincinnati Grinders, Inc. ... 62
Cleereman Machine Tool Co. ... 114
Cleveland Automatic Machine Co., The ... 79
Climax Molybdenum Co. ... 32
Columbia Tool Steel Co. ... 91
Continental Machines, Inc. ... 67
Crucible Steel Company of America ... 6, 7
Cullen-Friestedt Co. ... 105
Cunningham Co., M. E. ... 123
Cushman Chuck Co., The ... 112

Danly Machine Specialties, Inc. ... 123
Davis Boring Tool Division ... 92
Dearborn Gage Co. ... 115
Despatch Oven Co. ... 87
Detroit Power Screwdriver Co. ... 77
Detroit Stamping Co. ... 81
Dia-Tool, Inc. ... 73
DoAll Company, Inc., The ... 113
Dumore Company ... 124

Eclipse Counterbore Co. ... 98
Evans Flexible Reamer Co. ... 117
Everede Tool Co. ... 125
Ex-Cell-O Corp. ... 5

Federal Products Corp. ... 30
Firth-Sterling Steel Co. ... 23
Ford Motor Co., Johansson Div. ... 4

Fort Shelby Hotel ... 117
Fray Machine Tool Co. ... 83
Frick-Gallagher Mfg. Co., The ... 103

Gammons-Hoaglund Co., The ... 79
Garrison Machine Works, Inc. ... 125
Giern & Anholtt Tool Co. ... 125
Gisholt Machine Co. ... 14
Glenzer Co., The J. C. ... 105
Greenfield Tap & Die Corp. ... 41

Hanna Engineering Works ... 106
Hannifin Mfg. Co. ... 40
Hardinge Brothers, Inc. ... 1st Cover
Hartford Special Machinery Co., The ... 101
Haynes-Stellite Co. ... 29
Hobart Brothers ... 125
Hole Engineering Service ... 121
Holo-Krome Screw Corp. ... 2

Illinois Tool Works ... 33
International Nickel Co., Inc., The ... 21

Jarvis Co., The Chas. L. ... 90
Johnson Gas Appliance Co. ... 109
Jones & Lamson Machine Co. ... 17

Kearney & Trecker Corp. ... 16
Kent-Owens Machine Co. ... 37
Knight Machinery Co., W. B. ... 84
Koebel Diamond Tool Co. ... 119

Landis Tool Co. ... 39
LaSalle Designing Co. ... 119
LeBlond Machine Tool Co., The R. K. ... 4th Cover
Lee Co., K. O. ... 77
Lewthwaite Machine Co., T. H. ... 121
Lincoln Park Tool & Gage Co. ... 26
Lipe Inc., W. C. ... 22
Logansport Machine Inc. ... 20
Lovejoy Tool Co. ... 122

Machinery Manufacturing Co. ... 81
Macklin Co. ... 128
Majestic Tool & Mfg. Corp. ... 109
Matthews & Co., Jas. H. ... 109
McCrosky Tool Corp. ... 72
McKenna Metals Co. ... 104
Michigan Tool Co. ... 36
Micromatic Hone Corp. ... 38
Mid-West Tool & Mfg. Co. ... 120
Modern Collet & Machine Co. ... 121
Moline Tool Co. ... 118
Monarch Machine Tool Co., The ... 25
Monarch Steel Company ... 74
Morey Machinery Co., Inc. ... 73, 79, 85, 117

National Acme ... 99
National Broach & Machine Co. ... 15
National Tool Salvage Co. ... 121
National Twist Drill & Tool Co. ... 117
Nielson, Incorporated ... 109

Norton Company ... 8

Ohio Units ... 116
OK Tool Co., The ... 91
Onsrud Machine Works, Inc. ... 61
Oster Mfg. Company, The ... 113
Ott Machinery Sales, Inc. ... 121

Pioneer Engineering & Mfg. Co. ... 83
Porter Cable Machine Co. ... 93
Potter & Johnston Machine Co. ... 11
Pratt & Whitney Div. ... 2nd Cover
Producto Machine Company, The ... 101
Putnam Tool Co. ... 93

Racine Tool & Machine Co. ... 70
Ready Tool Company ... 107
Ruthman Machinery Co., The ... 114
Ryerson & Son, Inc., Joseph T. ... 68

Schauer Machine Co. ... 117
Scully-Jones & Co. ... 19
Sellers & Co., Inc., W. M. ... 107
Seneca Falls Machine Co. ... 27
Severance Tool Mfg. Co. ... 123
Shakeproof Lock Washer Co. ... 34
Sheffield Corp., The ... 71
Sheldon Machine Co., Inc. ... 119
Smit & Co., Inc., Anton ... 82
Smit & Sons, Inc., J. K. ... 89
Smith Power Transmission Co., The ... 121
South Bend Lathe Works ... 28
Specialties Manufacturing Co. ... 91
Standard Gage Co., Inc. ... 1
Starrett Co., The L. S. ... 60
Sterling Tool Products ... 75
Strippit Corporation, The ... 111
Stuart Oil Co., Ltd., D. A. ... 64
Sundstrand Machine Tool Co. ... 9
Sundstrand Pump Division ... 18
Sunnen Products Co. ... 24
Sutton Tool Co. ... 123
Swartz Tool Products Co., Inc. ... 81

Tannewitz Works, The ... 78
Thompson, Henry G. & Sons, Co. ... 87
Tungsten Electric Corp. ... 85

Union Carbide & Carbon Corp. ... 29
Universal Engineering Co. ... 75, 89
United States Drill Head Co. ... 123

Van Norman Machine Tool Co. ... 65
Vascoloy-Ramet Corp. ... 35
Victor Machinery Exchange, Inc. ... 127
Vinco Corp. ... 107

Weldon Roberts Rubber Co. ... 115
Whistler & Sons, Inc., S. B. ... 115

Zeh & Hahnemann Co. ... 107
Ziegler Tool Co., W. M. ... 77

Please mention "The Tool Engineer" to advertisers when making inquiries

VICTOR'S BARGAINS IN TUNGSTEN CARBIDE TIPPED TOOLS

Price $1.00 Each In Any Size

NEW LOW PRICES — INCREASE PRODUCTION — CUT OPERATING COSTS

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials (such as hard rubber, bakelite, fibre), and tough alloy steels up to 500 Brinell hardness.

Left—100 Series

Left Hand-Reverse Image, Right Hand Shown

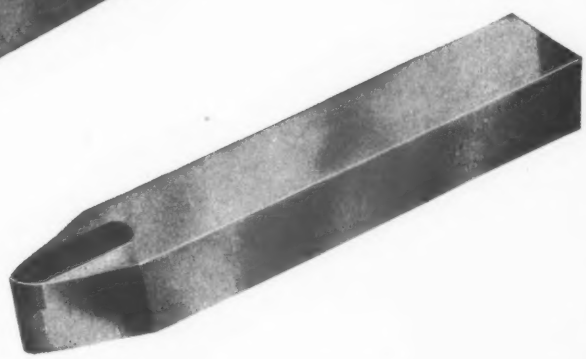
Tool No. RH	LH	Shank Size
R-100	L-100	1/4 x 1/4 x 2
R-101	L-102	5/16 x 5/16 x 2 1/4
R-103	L-104	3/8 x 3/8 x 2 1/2
R-105	L-106	7/16 x 7/16 x 3
R-107	L-108	1/2 x 1/2 x 3 1/2

Below—300 Series

Tool No.	Shank Size
300	1/4 x 1/4 x 2
301	5/16 x 5/16 x 2 1/2
302	3/8 x 3/8 x 2 1/2
303	1/2 x 1/2 x 3 1/2

Right—200 Series

Tool No.	Shank Size
200	1/4 x 1/4 x 2
201	5/16 x 5/16 x 2 1/4
202	3/8 x 3/8 x 2 1/2
203	7/16 x 7/16 x 3
204	1/2 x 1/2 x 3 1/2



STANDARD TUNGSTEN CARBIDE TIPPED TOOL BITS

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lot of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

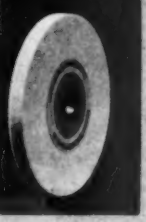
***We carry Silicon Carbide Emery Wheels* for Grinding Tungsten Carbide Tool Bits**

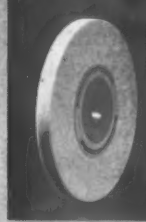
SEND FOR OUR NEW 1941 GENERAL CATALOGUE

Victor Machinery Exchange, Inc.

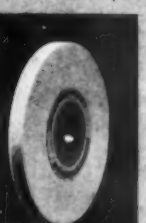
251 CENTER STREET **NEW YORK, N. Y.**

MACKLIN
Grinding Wheels





BACKING up grinding wheels of highest quality are Macklin's scientific laboratory experts, constantly probing for new and better means and methods to "Protect Your Production." These able men, with complete facilities, are ready—NOW—to solve your toughest grinding problems, thus saving precious time and continuing the even flow of vital production.



MACKLIN COMPANY

Manufacturers of GRINDING WHEELS—JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices:—Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

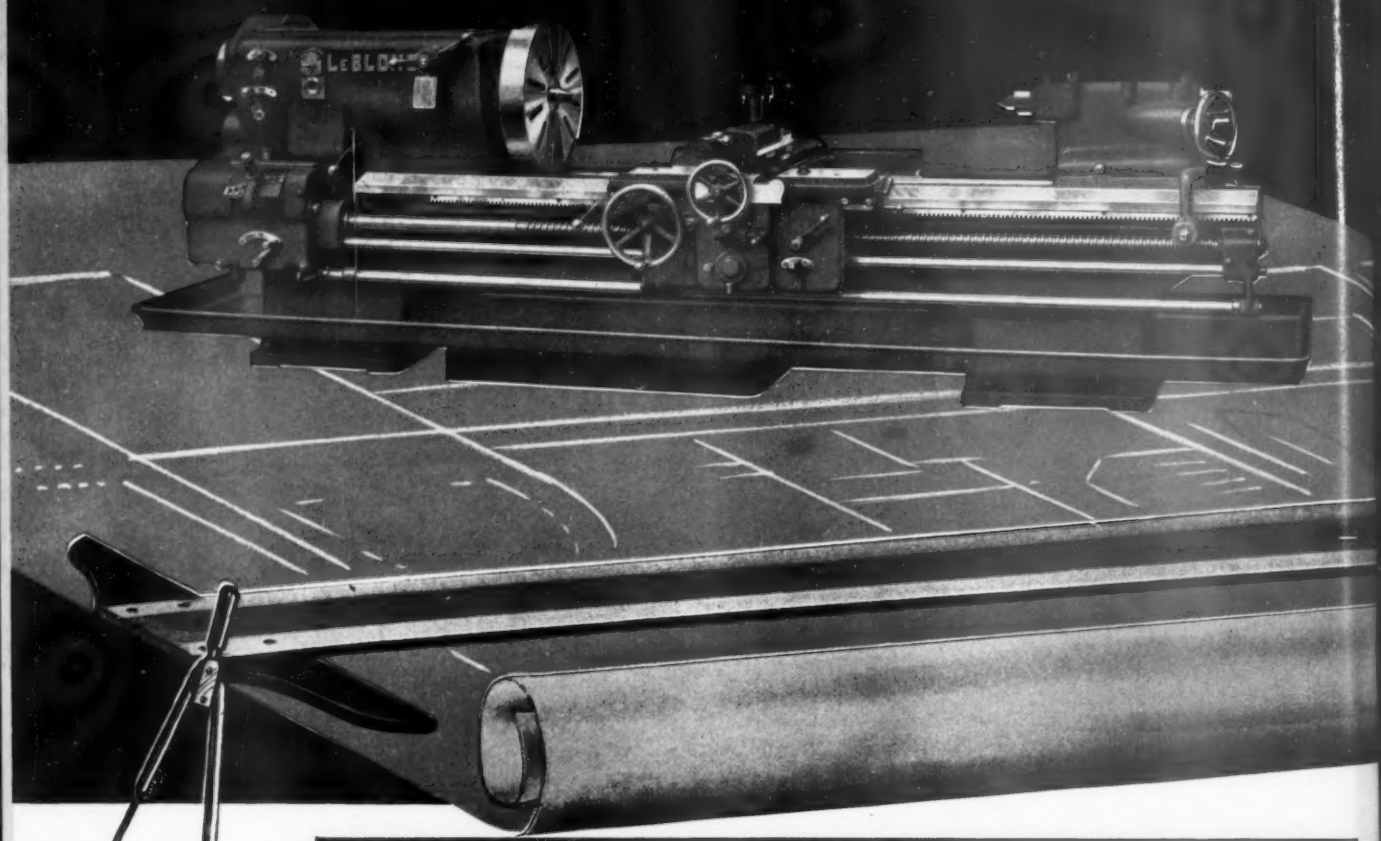
No 000 - *HIGHER* PRODUCTION

. . . AND GREATER ACCURACY on Small Parts Milling

Quick, accurate set-up
Automatic milling cycle
Smooth, efficient operation

Whether individually or in a battery, as shown above, No. 000 is highly profitable for milling in a broad range of materials. Write for details—Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE



Red White and Blueprint

In hundreds of plants the red-white-and-blueprints of patriotic production are calling to arms new tools, new methods, new efficiencies.

Most of the products of this mighty production will pass with the return to peace. But the new efficiencies will remain, a potential competitive weapon in any field to which their energies are turned.

The complacent manufacturer of B. D. days (Before Defense) may be gone forever, and a new, swifter pace will likely be the order of the peace-time era ahead.

In wise management circles, whether in or out of defense, plans are being drafted today. Old tools, good enough before, are going to be replaced with new tools good enough for the production pace ahead.

Right now is a good time to begin your investigation of new LeBlond Lathes — and make some interesting, perhaps vital, comparisons with your present equipment.

THE R. K. LEBLOND MACHINE TOOL COMPANY., CINCINNATI, OHIO

Chicago:
20 N. Wacker Drive
STA 5561

LEBLOND CINCINNATI, OHIO U.S.A.

New York:
103 Lafayette Street
Canal 6-5281